Looking to the Future

Alternatives for Reducing Flood-Related Damage in Historic Communities

Milton, Pennsylvania

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The Borough of Milton, Pennsylvania was settled along the banks of the Susquehanna in 1792. The Borough contains a large historic district that has a long history of repetitive flooding. Because Milton's residents and their historic buildings are subjected to a continued risk of devastating floods, a comprehensive plan was sought that addressed how to protect cultural resources from ongoing flood damage.

Through funding provided by the Federal Emergency Management Agency (FEMA), the Pennsylvania Emergency Management Agency (PEMA), and the Bureau of Historic Preservation of the Pennsylvania Historical and Museum Commission (PHMC) worked with the Borough of Milton to examine possible solutions and create a Model Demonstration Study that integrated the reduction of future flood damage with the protection of historic resources. The primary goal of this study was to provide the Borough with a planning process for the creation of a safe and sustainable historic community.

This document provides approaches that may be undertaken by the Borough to better integrate historic preservation goals into the Hazard Mitigation planning process. The study contains detailed information concerning the study's goals, the historical patterns of flooding in Milton, and proves a method for determining the cost-effectiveness of hazard mitigation options. The study is intended for use by Borough residents and local government officials, as well as representatives from regional, state, and federal agencies to select projects requesting Hazard Mitigation funding assistance. Other historic flood-prone communities may consider using this methodology to help develop their own pre-disaster plans to better protect historic properties.

Additional goals for this study were to:

- Provide recommendations for streamlining regulatory procedures for federal undertakings affecting historic properties;
- Suggest options for future integration of historic preservation and hazard mitigation land-use planning efforts; and
- Create a template for use by other historic communities in Pennsylvania.

A. HISTORY & PRESERVATION IN MILTON

Milton is a small river town in Central Pennsylvania settled on the floodplain of the West Branch of the Susquehanna River. Milton has a large historic district with over 700 buildings. The Borough has experienced a variety of man-made and natural disasters, including repeated and substantial flooding for more than two centuries. Milton maintains an existing and historical connection to industrial growth. The town was linked to a branch of the Pennsylvania Canal system, was an important local center for railroad traffic, and continues to be an industrial center.

Milton has demonstrated an ongoing commitment to the recognition of its historic buildings. Milton's governmental functions are housed in two historic railroad depots. Milton's historic district provides the visitor with a visual catalog of American town development and architecture from the 19th and 20th centuries. The district includes:

- A historic commercial business area that demonstrates early hazard mitigation approaches.
- A tree-lined street featuring impressive set-back Victorian-era homes with noteworthy architectural details.
- A neighborhood with numerous gable-front worker homes, closely set, located in a factory-sponsored development dating from the early 20th century.
- A neighborhood with examples of vernacular residential buildings that pre-date a 1880 fire and are examples of Milton's early history.

Milton's historic district, and four individual properties within the Borough, are listed in the National Register of Historic Places. The National Register is a formal listing of properties important to national, state, or local history and worthy of preservation. Projects receiving funds, involvement or permits from federal agencies must carefully consider the potential impact to buildings listed, or eligible for listing, in the National Register.

B. METHODOLOGY: INCORPORATING HISTORIC RESOURCES INTO HAZARD MITIGATION PLANNING

This study took place between June and December 2001 and involved multiple tasks, including an historic architectural survey, data gathering, public participation, and planning. Data concerning past flooding were gathered to form a predictive model for Milton. Historical accounts of flooding were researched, and a variety of qualitative flood data was collected that demonstrated the likely impact of future flooding.

One important goal of a historic community that is vulnerable to flooding is to create a vision for its future that achieves both the preservation of historic significance and historic architectural fabric of the community, while providing for relative safety and continuity for the future. To begin the visioning process, the community needed to identify and evaluate historic resources. A literature search was undertaken which identified important historic resources within the community. Interviews were also conducted with individuals familiar with local history. The existing National Register historic district was reviewed, with 100 properties selected to provide a representative sample of historic structures within the district. As part of this historic architectural survey, exterior photographs were taken of each property, and important information was collected regarding the construction and significance of each of the 100 properties. The boundaries of the historic district were compared with the boundaries of the 100-year and 500-year floodplains to delineate buildings that may be potentially affected by floods.

Using historic architectural survey data and other background information, a "preservation hierarchy" was developed. A numerical system was assigned to each surveyed structure based on a visual evaluation of the original physical fabric and design remaining at the time of the survey. The preservation hierarchy selected buildings based on the amount of remaining historic architectural elements and the strength of the resource's relationship to important local historic themes and important historical associations, not on aesthetic qualities. This information was correlated with other data collected in the field. The preservation hierarchy considered the value of surrounding historic buildings within a block-by-block and neighborhood basis, and resulted in a map that reflected the relative level of architectural and/or historical importance of each of the 100 buildings.

Based on a review of the historic architectural survey information, the historic district was subdivided into five distinguishable neighborhoods. Thirty of these representative properties were selected for further risk analysis and use in the planning project. *Reproduction Costs* were developed for these thirty properties. These *Reproduction Costs* were determined through a standard valuation of the costs of modern construction and materials, and were then multiplied by a factor that reflected the costs associated with the reproduction or repair of important historic details. A further analysis of these thirty representative buildings was performed to determine their level of risk to harm from future natural disasters. The cost-effectiveness of different hazard mitigation alternatives was calculated through an analysis of the cost of the building and the potential severity of future flooding, and the cost of the hazard mitigation alternative. For each hazard mitigation alternative, hazard mitigation project costs for each building were estimated through consultation with a local contractor, house mover, and realtor. This analysis included consideration of costs associated with different types of historic buildings.

Historic architectural survey information, including risk data as well as the preservation hierarchy, was placed into an integrated Geographic Information System (GIS). The integration of different types of data illustrated the relationship between the location of historic properties, their different *Reproduction Costs*,

the different levels of risk of flooding, the cost-effectiveness of hazard mitigation alternatives, and their placement within the preservation hierarchy.

Several public outreach efforts provided the study with the views of local residents and integrated their valuable input into the process. A detailed questionnaire was mailed to all residents and owners in the flood-prone portion of the historic district. This questionnaire asked for input regarding the identification of historic buildings and the use of various hazard mitigation alternatives. Three public meetings presented information about the study and featured public discussion. An interactive poster encouraged residents to identify neighborhoods and places they thought did the best job of illustrating local history.

C. POTENTIAL HAZARD MITIGATION OPTIONS

One of the goals of this demonstration study was to examine various options that would minimize future damage from flooding. Milton has experienced several centuries of consistent flooding that have exacted a heavy financial and emotional toll on the Borough's residents. The following options were examined both for their effectiveness at reducing flood-related damages and also for their potential effects to historic structures:

- *Acquisition and Demolition* – This option would include the demolition of flood-prone historic structures, leaving the property in "open space" usage. Although it is likely that these properties would be documented, the demolition would have a severe negative impact upon these historic properties in that affected historic properties would be lost through demolition. However, demolition would remove affected properties completely out of the path of future flooding, eliminating future disaster costs.
- *Relocation* – This option would result in the relocation of flood-prone historic structures out of the floodplain. This option is highly effective in reducing potential harm from flooding. However, to minimize negative impacts to historic buildings, moved buildings would need to be relocated in a manner that replicates their setting, including landscape elements, outbuildings, and their relationship to surrounding structures.
- *Elevation* – This option would entail the in-place elevation of existing flood-prone historic buildings and would require the construction of new, stronger foundations. This option is effective in minimizing flood-related damages; in the case of Milton, many structures would only need to be elevated several feet. Elevated structures could still be eligible for listing in the National Register of Historic Places if elevation work included the re-creation of the original grading, landscaping, and other elements so that they approximate their original scale and setting.
- *Floodproofing* – This option would include the retrofitting of flood-prone historic structures. Potential methods of floodproofing might include the relocation and elevation of utilities, or, in the case of some commercial buildings, the structural retrofitting of buildings to make them watertight below a selected elevation. Floodproofing is the least intrusive means of preventing flood-related damages, but also the least effective if the floodwater exceeds the flood protection elevation
- *Structural Flood Diversion Improvements & Stream Channel Modifications* – This option would include the construction of structural elements that would divert the river flow away from the Borough. A combination of a levee and structural floodwall, although expensive, could provide considerable protection to the Borough against future flooding. The construction of a floodwall/levee would also require the demolition of several historic buildings (although the use of a specialized floodwall rather than a levee would spare many buildings from demolition). Channel Modifications, such as removing islands, were also examined but were determined to have a minimal or no effect in lowering flood levels.

The following table compares each of the different hazard mitigation alternatives, as described above, for their potential to reduce the level of risk (to life and property) and the effects such alternatives might have upon historic buildings.

Hazard Mitigation Alternative	Reduction of Risk	Level of Impact to Historic Properties
Acquisition & Demolition	High	High
Relocation	High	Medium - High
Elevation	Medium	Medium
Dry Floodproofing	Low - Medium	Low - Medium
Wet Floodproofing	Low	Low
Stream Channel Improvements	Low	High (archeology)
Levees & Floodwalls	Medium	Medium

D. OUTCOME & RECOMMENDATIONS

This study identified a planning process that applied each of the hazard mitigation options to buildings within the representative sample. This planning process used the least intrusive options for the most significant buildings.

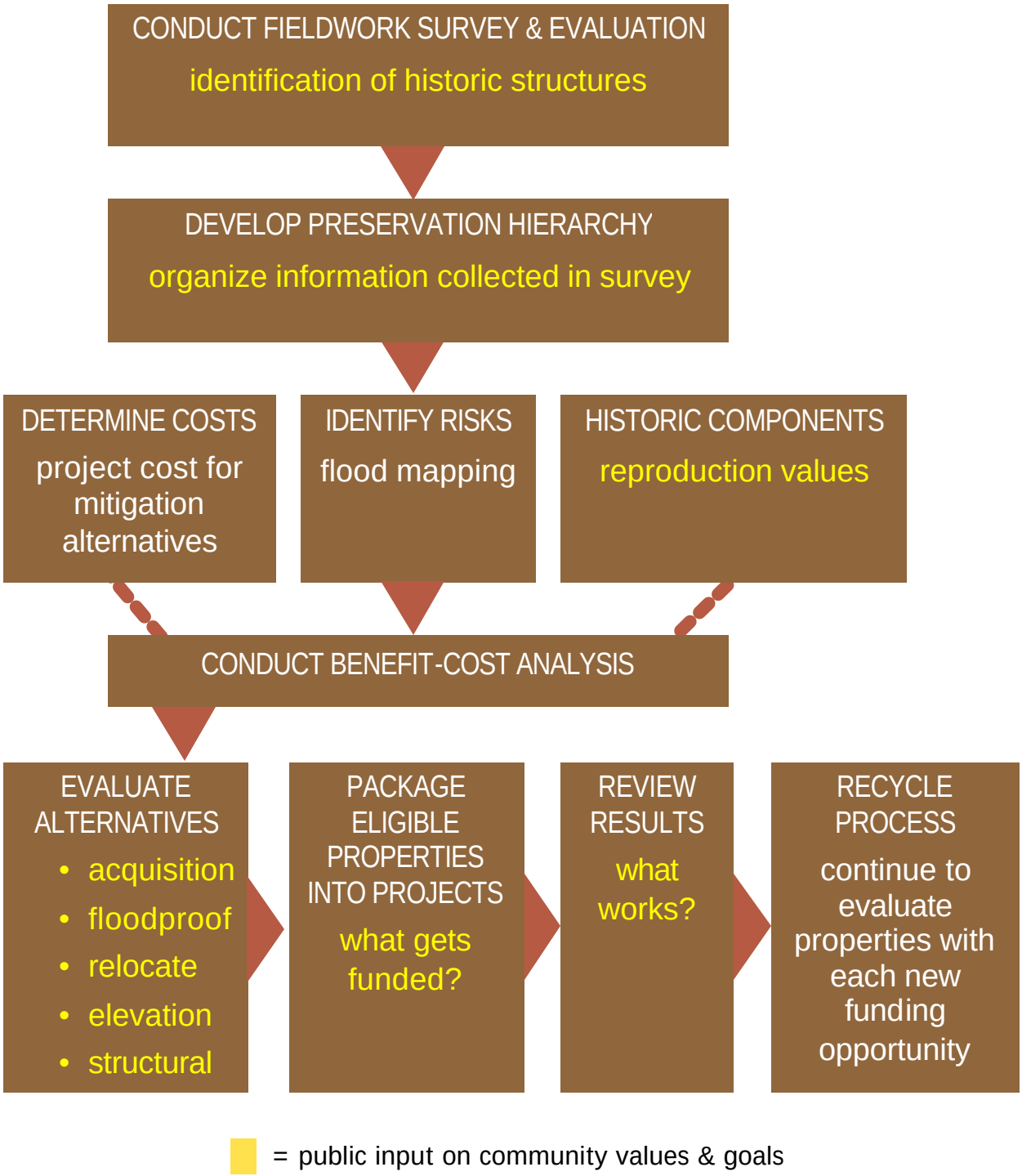
The key study conclusions include:

- Various hazard mitigation alternatives are feasible for Milton. The study showed that Milton's citizens have options in selecting how to minimize future flood-related damages to their properties. The Borough of Milton should undertake a comprehensive review of the potential impacts of all hazard mitigation alternatives to both industrial buildings, and to the community as a whole.
- The hazard mitigation alternatives evaluated in this study illustrated that, for individual structures, selected alternatives produced different levels of flood protection for life and property and differing impacts on the historic integrity of their structure and the overall historic character of the Borough.

Several useful planning tools identified include:

- A Community-Based Decision Making Model (page PS-5) that utilizes public input and integrates hazard mitigation planning, historic preservation goals, and community development objectives.
- Suggested information to be included in Hazard Mitigation Grant applications for projects that focus upon historic resources.
- Points to be considered in a potential interagency agreement which would streamline regulatory review of federal projects concerning flood-prone historic buildings.
- Highlights of areas in which the State Emergency Management Agency (PEMA) and the State Historic Preservation Office (PHMC) can continue to integrate land-use planning efforts.

Recommended Decision Making Process for Milton



1.1 NEED FOR DEMONSTRATION STUDY

In 2001, the Federal Emergency Management Agency (FEMA) retained the services of URS Group, Inc. (URS) to prepare a Hazard Mitigation/Historic Preservation Demonstration Study for the Borough of Milton in Northumberland County, Pennsylvania. In cooperation with FEMA, three other cooperating partners were involved in the study: the Pennsylvania Emergency Management Agency (PEMA), the Pennsylvania Historical & Museum Commission's Bureau of Historic Preservation (PHMC), and the Borough of Milton.[1]

The overall goal of the study was to develop a planning process for future hazard mitigation projects that would use the least intrusive techniques for the most historic buildings, employ a variety of techniques for different buildings, and reduce damages from natural hazards.

The project partners developed a decision-making process for the Borough. The decision-making process allows communities to create hazard mitigation projects that reflect a variety of community goals. This process may also to serve as a model or blueprint for other Pennsylvania communities as they develop or update their flood prevention plans in the future**.**

One of the most critical components of the planning process was the collection of information. Data was gathered about historic properties in Milton, the cost-effectiveness of various treatment options, and the values of the community itself. A strong emphasis was placed upon public participation and involvement through a series of outreach efforts including surveys, meetings, and posters. Expanded information is contained in a series of endnotes, placed at the conclusion of this report.

Finally, this study developed a model that could be used in Milton to evaluate how future flood mitigation projects might be selected, but that could be replicated in other historic Pennsylvania communities with similar repetitive flooding problems.

Where can I find other information about Hazard Mitigation Planning?

FEMA is producing a number of "How-To" planning guides, which explain different aspects of Hazard Mitigation Planning.

One guide, the sixth in the series and scheduled for publication in 2003, provides planners with general information about historic preservation.

Hazard Mitigation Planning and the Disaster Mitigation Act of 2000 (DMA)

The Disaster Mitigation Act of 2000 provides increased emphasis on the importance of Hazard Mitigation planning in local communities. The Disaster Mitigation Act rewards local governments that can form collaborative and effective public-private partnerships and establish priorities for hazard mitigation projects.

In addition, the Act places an emphasis on assessing risks, encourages hazard mitigation to become integrated with other planning initiatives, and highlights the development of hazard mitigation technologies.

1.1.1 Repetitive Flooding in Milton

Located on the east bank of the West Branch of the Susquehanna River, Milton, Pennsylvania has had a long history of flooding. For example, according to the U.S. Army Corps of Engineers Baltimore District's 1995 study *Milton, Pennsylvania Local Flood Protection Reconnaissance Study*, six major floods occurred in the Borough of Milton during the past 60 years. One of the worst of these floods, the one caused by Tropical Storm Agnes in 1972, resulted in an estimated $39 million in damage to the community's homes, businesses, and industries. According to the U.S. Army Corps of Engineers, a recurrence of a flood of

What is a historic property?

While there are many different ways to define this term, a historic property may be considered a building, object or site which

(a) is important to local or national heritage, and

(b) is associated with significant individuals, or design/construction methods.

this magnitude as of 1995 would cause an estimated $85 million in damage (U.S. Army Corps of Engineers 1995:1.1). The Borough of Milton is a participant in the National Flood Insurance Program (NFIP) and has adopted a local floodplain ordinance. In addition, working with SEDA-COG (a regional planning agency), the Borough has developed a strategic Floodplain Management Plan.

1.1.2 Continued Integrated Planning between PEMA and PHMC

This demonstration study also highlighted the importance of integrating land-use planning efforts used by PEMA and PHMC. In some hazard mitigation projects, the objectives of an Emergency Management Agency, such as PEMA or FEMA, have been in conflict with those of a State Historic Preservation Office, such as PHMC. By ensuring that the goals of both groups are understood, it becomes much easier to identify and implement projects that are mutually acceptable.

1.1.3 Project Review under Section 106 of the National Historic Preservation Act

Currently, a number of federal historic preservation laws exist that afford protection to historic properties. Most important among these is the National Historic Preservation Act of 1966 (NHPA). This law created the existing partnership among the federal, state, and local levels of government. In addition to providing the federal government a greater role in promoting historic preservation, NHPA also established each of the following programs and preservation tools:

- The National Register of Historic Places;
- Individual State Historic Preservation Offices (SHPOs) including the Bureau of Historic Preservation of the Pennsylvania Historical and Museum Commission (PHMC); and
- A provision within the NHPA known as Section 106.

Much of the language in the National Historic Preservation Act was created in reaction to the loss of historic properties during the 1950s and 1960s.

Since the passage of the NHPA, any undertaking funded, licensed, or permitted by a federal agency is subject to Section 106 review. Section 106 is similar to the National Environmental Policy Act of 1969 (NEPA) in that it is a procedural law; Section 106 does not mandate historic preservation. However, it does require federal agencies to do two things:

Section 106 Process in Brief

What is an undertaking? Essentially, it is a project that has federal agency involvement (direct federal action, federally funded action, or federally permitted action) and that has the potential to affect historic properties. Examples:

- The construction of a new federal building to provide office space for government workers;
- A local community's urban re-development project in an economically depressed neighborhood using federal funds;
- A private developer's project to construct a group of vacation homes and a golf course that will involve a permit from the U.S. Army Corps of Engineers to fill wetlands or to affect waterways.

What is an effect? An effect is an action that will *change* the qualities that make a property eligible for National Register listing.

Effects may be adverse, meaning that the project will *diminish*—not just change—the qualities for which a property is National Register eligible. Adverse effects include:

- **physical destruction or demolition** (either partial or complete);
- **alteration** of a property in such a way that the alteration is not consistent with accepted standards for the treatment of historic properties;
- **removal** of a historic property from its historic location;
- **change** of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- **neglect** of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to Native American tribal nation or Native Hawaiian organization; and
- **transfer, lease, or sale** of a property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

- Consider the effects of projects that they undertake—or the effects of projects that they assist others to undertake through federal funds, licenses, permits, or authorizations—on historic properties; and
- Afford the Advisory Council on Historic Preservation—an independent federal agency—an opportunity to comment on these undertakings.

Similar to NEPA, Section 106 of NHPA is a procedural law that essentially requires federal agencies to "stop, look, and listen" to identify potential impacts upon historic properties. Compliance with Section 106 does not mandate that historic preservation be the course of action taken with respect to federal undertaking, but does require consideration of the potential effects to historic resources of those undertakings. If there is a failure to comply with Section 106, project funding from federal agencies, (including FEMA) may be withdrawn. Section 106 is an important cornerstone of federal historic preservation law and often does result in the preservation of historic properties.

Much of the work that FEMA assists others in completing is performed in response to an emergency or immediate threat to safety or property. However, not all of the work that FEMA funds is used to eliminate such risks. Many of the projects for which FEMA provides assistance are preventative, pre-disaster undertakings. Similar to other forms of planning, pre-disaster planning is envisioned to be a process that carefully considers the broader impacts of all available alternatives. Section 106 review is similarly intended to be a planning process that carefully weighs options and measures their level of impact upon historic properties.

Unfortunately, hazard mitigation planning is often completed independent of the planning required through the Section 106 consultation process. The two planning processes may fail to achieve their full potential as useful tools for community growth. Section 106 review is often completed towards the end of the hazard mitigation project planning or identification process.

1.2 GOALS OF DEMONSTRATION STUDY

The demonstration study culminated in a number of products, including this report. The demonstration study is intended to serve as an educational tool and template for communities seeking to apply more effective mitigation strategies to floodplain plans. These strategies may also lead to a better understanding of their public participation responsibilities required by federal historic preservation laws. The study is also intended to identify ways in which communities can

Section 106 Process

While Section 106 does *not* mandate preservation or protection of historic properties; it does *require* federal agencies to consider ways to avoid, minimize, or mitigate adverse effects to historic properties before deciding to proceed with an action having an adverse effect.

Before making its decision on how it will proceed with an undertaking, each federal agency must follow a process of review and consultation:

- **Initiation** of the Section 106 review process where the federal agency and its applicant determine if the proposed action constitutes an undertaking, and, if so, whether the action has the potential to affect historic properties;
- **Identification and evaluation** of historic properties where the federal agency and its applicant determine in consultation with the State Historic Preservation Office if any historic properties lie in the undertaking's area of potential effects;
- **Assessment of effect** where the federal agency and its applicant determine in consultation with the State Historic Preservation Office if the undertaking will have an effect on historic properties, and if so, what this effect will be; and
- **Resolution of adverse effects** where the federal agency and its applicant consult with the State Historic Preservation Officer (SHPO) and other consulting parties (including local governments, historic preservation groups, Native American tribes, etc.) as appropriate. In certain cases, the federal agency will enter into a legally binding contract, known as a **Memorandum of Agreement or MOA**, with the SHPO and the other consulting parties.

Once the above steps have been completed, the federal agency can either proceed with its action, or release the funds, license, or permit to its applicant.

Not following these steps prior to funding or licensing the project (or assisting a project that has already begun without following these steps) means that the federal agency has foreclosed or precluded the Advisory Council's opportunity to comment on the undertaking.

Starting the project prior to Section 106 compliance also places the federal agency at risk for potential lawsuits by environmental or historic preservation advocacy organizations, which often object to certain types of Federally assisted actions on principle.

participate in the identification and selection of hazard mitigation alternatives that help to minimize adverse effects on historic buildings, both before and after a disaster strikes.

The overall goal of the study was to develop a planning process for future hazard mitigation projects that would identify the least intrusive techniques for the most important historic buildings, identify a variety of techniques for different buildings, and reduce damages from natural hazards.

Within this goal were four primary objectives:

- Undertake a model demonstration project for use by an historic Pennsylvania community with a significant number of historic properties subject to repetitive flooding;
- Develop a pre-disaster planning process for Milton with the goal of reducing the loss of human life and property while minimizing adverse effects to historic structures as a result of FEMA programs (this planning process was used to examine the advantages and disadvantages of different hazard mitigation options, and their effects on historic properties);
- Streamline the Section 106 review process used by FEMA in funding hazard mitigation projects in Milton; and
- Provide recommendations regarding future cooperative efforts among the project sponsors—FEMA, PEMA, PHMC, and the Borough of Milton—to help achieve overall hazard mitigation project goals.

Front Street and Broadway form the center of Milton's commercial area.

The project sponsors developed a decision making process for the Borough. This process, illustrated in this report, was also intended to serve as a model or blueprint for other Pennsylvania communities as they develop or update their flood prevention plans in the future.

The Borough of Milton: Established in 1792, Milton has a historic district that was listed in the National Register of Historic Places in 1986. The district contains 719 contributing resources that reflect many different building types and architectural styles. However, many of Milton's historic buildings are subject to repetitive flooding. FEMA and PEMA selected Milton from a list of 78 communities recommended by PHMC.

Arch Street in Milton during a 1975 flood.

Damaging floods have affected Milton throughout its history. The town's location on the Susquehanna has provided it with numerous economic and scenic advantages. At the same time, frequent and sometimes severe floods have stunted the economic growth of Milton over its long history. Milton has experienced 40 floods since 1846, each of which has risen over the low water mark of 19 feet at which the flood stage is defined. Ten of those floods crested above 25 feet, and four of those floods rose above 30 feet (with the record set at 35.10 feet in 1972). Milton has co-

existed for more than 200 years along the river and periodically has been forced to rebuild and repair damage to its buildings and bridges. The frequent flooding has also created an additional obstacle for the Borough's central commercial district. Since its earliest days of settlement, Milton's access to water resources has been a benefit while also serving as a substantial threat.

FEMA and Historic Preservation: During the past decade, FEMA has taken steps to better integrate historic preservation into its programs. For example, the agency successfully negotiated a nationwide model Programmatic Agreement with the National Conference of State Historic Preservation Officers. It is important to note that this agreement requires preservation to be factored into disaster recovery efforts as a balance to the streamlined review process following a disaster declaration.

Repetitive flooding has a negative economic effect on the growth of Milton's commercial district.

While the model Programmatic Agreement continues to be an important historic preservation tool, for many states, relatively little headway has been made in integrating preservation into pre-disaster planning and hazard mitigation efforts. This difficulty is unfortunate because post-disaster project decisions are often based on emotional responses made in the days following traumatic disasters. In addition, deep divisions within communities and between governmental agencies are often revealed through this decision making process.

As a consequence, historic preservation organizations, including the National Trust for Historic Preservation, have identified areas of improvement for FEMA related to its approach to damaged historic buildings. These advocacy groups have also been involved in court litigation in a number of cases during the past decade. Thus, a proactive approach to treating historic properties in disaster situations, which includes all of the interested parties, would likely produce a more coordinated and expedited solution.

Milton's major industrial employers are also vulnerable to flooding.

National Flood Insurance Program: Beginning with its authorization in 1968, the federal government has provided a National Flood Insurance Program (NFIP). The Borough of Milton has participated in this program since 1972 (U.S. Army Corps of Engineers 1995:7.2). As it was originally envisioned, the NFIP would "promote the public interest by encouraging sound land use by minimizing exposure of property to flood losses" (International Code Council 2000:1.2).[2]

While the NFIP sets minimum standards for communities to participate in the program, a large number of these communities have voluntarily set a higher standard for the creation of new development.[3] Communities must develop a floodplain ordinance that sets standards for construction and rehabilitation of structures located in flood-prone areas. Communities that participate in the CRS receive a rating between 1 and 10, 1 being the highest and preferred rating and 10 being the lowest.[4]

Milton's Floodplain Management Plan developed with SEDA-COG (Council of Governments) in 1998, and approved by FEMA, provides the Borough with an opportunity to accrue future CRS points. The Borough has also adopted a local floodplain ordinance.

Another concept used in the NFIP is the issuance of elevation certificates. Elevation certificates are useful in determining insurance ratings, and are applied to all new construction in floodplains to determine if the construction meets requirements of the NFIP.[5] Milton and SEDA-COG have worked together in the production of elevation certificates.

Hazard Mitigation Grant Program (HMGP): Over the past decade, FEMA has given more attention to disaster prevention, which it refers to as "hazard mitigation." Through its enabling legislation, the Stafford Act, FEMA, and the state emergency management agencies were directed to reduce or eliminate potential risks to life and property. At the same time that it has promoted the elimination of natural hazards, FEMA has gradually shifted away from structural flood-control alternatives, such as levees and flood walls, in part because of the significant negative effects these alternatives may have on communities. FEMA has increasingly undertaken projects featuring "non-structural" measures such as acquisition and demolition or relocation of buildings.

Why are some Hazard Mitigation projects at odds with the goals of Historic Preservation?

Hazard mitigation is often achieved through the demolition or alteration of high-risk, "repetitive-loss" buildings. Many of these buildings are also historic.

Through the HMGP program, communities may apply for assistance through their state emergency management agency, which works with FEMA to prioritize applications and evaluate the projects. If approved, FEMA funds 75 percent of the community's eligible costs.[6]

Integrating Historic Preservation with Hazard Mitigation Planning: Many preventive flood mitigation measures, including flood walls and levees, demolition, relocation, and elevation, often destroy or damage historic properties. Partial floodproofing, which involves the elevation of utilities, is less damaging to historic structures, but does little to minimize risk. As a result, historic properties are increasingly targeted for demolition. While preservationists and hazard-mitigation planners both share a common goal of sustainable community development, their means are often in apparent conflict.[7]

However, there is considerable potential for increased integration of preservation and disaster management agencies.

Using a small Pennsylvania town in a model study, this report illustrates how historic preservation can be successfully factored into pre-disaster planning.

2.1 HISTORY OF FLOODING

The Borough of Milton, Pennsylvania is a small town located in the northern portion of Northumberland County in Central Pennsylvania, directly adjacent to the West Branch of the Susquehanna River. Milton's location on the Susquehanna River has helped to indelibly define its character as a place of commerce. Milton—the name was derived from "Mill Town"—has historically been a place of industrial development, beginning with construction of a gristmill at the time of its early settlement and continuing to the present day with the operation of two factories that employ many of the town's residents. Milton is also defined by its relationship to the Susquehanna River and is a true river town. The riverfront forms a historic corridor that helped to develop the borough's earliest industries, and continues to contribute to the area's visual and environmental character. Many of Milton's buildings date from the late 19th and early 20th centuries. While numerous buildings were built in the decades following a disastrous fire in 1880, several buildings pre-date the fire. Milton's historic architecture represents a diverse collection of styles and forms.

In addition to the 1880 fire, the Borough's many floods have shaped the character of Milton. Repeated floods have become part of the history and building tradition of the town (as evidenced by the development of raised foundations). Indeed, the history of Milton's floods provides a fascinating review of how citizens have coped with hardship and overcome adversity.

"Repeated floods have become part of the history and building tradition of the town…"

However, it is also important to consider Milton's history of repetitive flooding in understanding how such disasters can stunt economic growth. Repairing flood damage has long been a fact of life in Milton; considerable resources have been spent rebuilding and repairing the Borough's homes, businesses, and infrastructure.

Since 1846, Milton has experienced 40 floods that rose over the flood stage of 19 feet. Ten floods crested over 25 feet, and four floods rose above the 30-foot mark, with the water rising to 35.10 feet in 1972 to set the current record.

An early view of the Susquehanna River, near Milton.

Milton's Flood History

Early Floods: Although unsubstantiated, local legend describes Native Americans living in the area who believed that a major flood occurred along the Susquehanna River every 14 years. Historical records largely substantiate this belief, as floods on the river were recorded in 1692, 1731, 1740, 1744, 1758, 1772, and on March 15, 1784, which was known as the "Great Ice Flood." Four autumn floods, called the "Great Pumpkin Floods," occurred on October 5, 1786, October 1, 1787, November 20, 1810, and in November of 1817. The earliest recorded flood in

Milton led to the relocation of Limestone Run. A tributary of the Susquehanna River, Limestone Run once jogged far to the south of Milton before emptying into the river, until modifications to its channel were made during the late 18th century. The area previously used by the former channel became Andrew Raub's settlement of Lower Milton. Unfortunately for Raub, flooding around 1800 destroyed the settlement, which was promptly rebuilt. The new channel also gave Raub valuable water rights that could be used to power milling operations along the creek.

A kayaker explores Milton during the 1894 flood.

1817 Flood and Limestone Run: On August 9, 1817, an event known as the Great Limestone Flood demolished an 1808 stone bridge, as well as several dwellings and stores in Lower Milton that had been constructed in the creek's former streambed. The stone bridge was replaced the following year.

The construction of the Pennsylvania Canal in 1830 created two additional paths for Limestone Run, which flowed underneath an aqueduct for the canal. Subsequent 19th-century maps for Limestone Run depict two paths above the aqueduct along present day Center Street. Limestone Run was again altered in the early 20th century when residential developers created an entirely new channel. Additional alteration of the streambed later took place with the completion of a box culvert by the U.S. Army Corps of Engineers in the late 1970s.

1865 Flood: A severe flood on St. Patrick's Day in 1865 swept away many or all of Milton's bridges. An early spring rain that increased the already heavy winter snowmelt caused the flood. Front Street was covered by more than 6 feet of water; Lower Milton experienced the greatest amount of damage. The river rose over 16 feet and carried with it damaging debris from upstream logging camps. The *Williamsport Banner*, a local newspaper, proclaimed the event was "The Greatest Flood Ever Known." An earlier flood in 1847 swept away the middle portion of a bridge across the river. The rebuilt structure was completely demolished by the 1865 flood and later replaced by an iron bridge.

The first floors of many of Milton's commercial buildings are subject to repetitive flooding.

1889 Flood: Milton experienced another severe spring flood between May and June of 1889. Older citizens who remembered the 1865 flood tried, often in vain, to warn newer residents of the impending damage. Water moved through Upper Milton across Lincoln Street to the car works and canal. The river brought a steady stream of damaging debris from upstream. Local damage was estimated at $300,000 in 1889 dollars. At its highest point, the flood is estimated to have covered 90 percent of Milton.

1894 Flood: In 1894, the town of Milton again experienced severe flooding, particularly in the area around North Front Street. The Susquehanna crested at 29.15 feet, over 10 feet above the low water mark. The town became an interesting spectacle as boats navigated streets. An article in the *Milton*

Standard stated that "Milton has again been submerged and property damaged thousands of dollars [sic]. At eleven o'clock last night Broadway and Front Street were a seething mass of dirty, muddy water. Almost every home on Front Street, above Broadway, was deserted last night." The article went on to note that homes along Walnut Street saw flooding five feet above the first floor elevation. A limestone bridge, rebuilt the earlier year after previous flood damage, collapsed.

The 1936 flood disrupted local businesses, as seen here along Broadway.

1936 Flood: In March of 1936, Milton experienced another devastating flood as heavy rain events combined with fast-melting snow, and the Susquehanna rose past the high-water marks of 1889 and 1894. Martial Law was declared, and roughly a third of Milton's citizens were homeless. Over 1,400 homes were damaged by flooding, and 600 homes were declared eligible for state aid, Federal Housing loans, or Red Cross assistance. In addition, the flood placed further financial pressure on businesses already feeling the crunch of the Great Depression. One long-time resident remembers that "Father, for one, lost thousands in the devastation of business material from the high muddy water and clean-up that followed." (Krause) The 1936 disaster also worsened an already grim economic situation.

The downtown commercial district and North Front Street were the first neighborhoods to flood during the daytime. A period account recalls that "a few ventured cautiously in boats as far as Front Street where they could see through the Lincoln Park opening to the main stream; houses, furniture and all kinds of debris float by." (Krause) By night, the water continued to rise further along Center Street; flooding came at first from a back-up of Limestone Run, and later from the Susquehanna itself. Along Center Street, one family found the water threatening the first floor:

> By 4:00 a.m. the water was gurgling within an inch of coming over the hardwood floors. It was an awesome sight seeing the flickering light of a candle reflected across those polished inlaid hardwood floors and knowing that the water was only an inch away. (Krause 255)

"It was an awesome sight seeing the flickering light of a candle reflected across those polished inlaid hardwood floors and knowing that the water was only an inch away."

-Center Street Resident, 1936

1972 Flood: On June 22, 1972, Milton again experienced its most devastating flood. Hurricane Agnes moved inland over central Pennsylvania and collided with an erratic cold front to produce heavy rain. The river subsequently set its high water mark at 35.10 feet (over 16 feet above the flood stage). More than a dozen residences were deemed structurally unsound following the flood, and an additional two dozen homes were substantially damaged. One Milton resident noted that:

Milton during a 1975 flood.

> Of course, I tried to warn friends about the flood; but all said it can't be worse than 1936 and many left their

> things on the table tops. After the river went down and people could get into their business places and homes, most found little left and many business people closed for good, one church moved to the country, and many homes were never lived in again, and parks or gardens made in their places. (Krause 254)

The 1972 floods also had a similarly devastating impact on the other communities along the Susquehanna. Worst of all, the flood took 11 lives, including four in Northumberland County alone.

The crest of the 1972 flood in Milton.

Following the costly clean-up of the 1972 flood, the Pennsylvania Secretary of Environmental Resources, Dr. Maurice K. Goddard, stated his opposition to flood control plans and expressed preference for the demolition and rebuilding of flood-prone communities. These remarks inspired an editorial from the *Milton Standard*'s editor, who noted that although

> that kind of thinking is great if you're about to build a new town, but what of the costly structures that are already located in this area? Are they to be torn down? For instance, Milton would have one god-awful parking lot and park. (*Milton Standard* 1972)

The 1972 flood was followed by another large flood in September of 1975 in which the flood crest reached 29.8 feet, 10 feet over the low water mark. Together, the 1972 and 1975 floods provided local building officials with additional justification for the demolition of over 400 flood-prone structures, primarily located between Broadway and Mahoning Street. Thus, an urban renewal project, already in the planning stages before the 1972 flood, was undertaken by the U.S. Department of Housing and Urban Development, the Borough of Milton, and the Northumberland County Redevelopment Authority. Many of the demolished buildings would likely have been eligible for listing in the National Register of Historic Places. Milton has not fully recovered from the loss of population, tax base, and historic character following the destruction of the 400 buildings (housing roughly a quarter of the town's population).

"Many of the demolished buildings would likely have been eligible for listing in the National Register of Historic Places."

1996 Flood: Although not as disastrous as the damage from earlier floods, Milton experienced further flood damage in the winter of 1996 following a large snowstorm. The river crested at 28 feet on 7:30 a.m. on January 20. Ice chunks were brought inland by the flood, stranded, and produced very cold runoff, which later re-froze and thawed in a repeating cycle that caused substantial damage to historic buildings. Considerable amounts of debris, mud, and dead fish were spread throughout Front Street, and the area just to the north of Milton experienced particularly severe damage. The 1996 flood level was approximately 7 feet lower than the 1972 flooding.

An aerial view of South Front Street during the 1975 flood.

2.2 HISTORIC PROPERTIES

History may be loosely defined as a study of past events, people, and places. The study of the past:

- Reveals important information about the present and future;
- Allows connections to be drawn between different peoples, experiences and places; and
- Satisfies a basic human curiosity about what events happened in particular places at particular times.

Societies communicate past events in many ways:

- Oral stories passed down through generations;
- Diaries, memoirs, and photo albums;
- Published studies and official retrospectives; and
- Spiritual beliefs.

An additional way in which the past is portrayed is through a study of historic properties including buildings, objects, structures, historic districts, objects, and sites. Historic properties help provide communities with a unique "sense of place." In addition, historic properties provide an important opportunity for economic development. However, because historic properties are often privately owned buildings in need of continual care and maintenance, they require a high level of planning and community coordination to maintain and preserve them.

By definition, a historic property is any property that is listed in or may be eligible for listing in the National Register of Historic Places. The National Register was established in 1966 with the passage of the National Historic Preservation Act. In its broadest sense, the National Register is a planning tool that highlights the importance of properties worthy of preservation. The National Register is also a list of properties that have met certain criteria and are legally recognized as historically significant places. These properties may be important on the local, state, or national level.

The National Register currently contains entries with information on over 73,000 formally listed properties. The Register includes historic districts, individual buildings, farms and landscapes, archeological sites, even airplanes. Certain properties are groupings of buildings that lack individual distinction, but together have been judged to be significant as a historic district, such as the one in Milton.

Both federal and state agencies are involved in the maintenance and expansion of the National Register. The Register is administered by the Secretary of the Interior and the National Park Service. Properties are usually listed through a process administered by State Historic Preservation Offices (in some

What is Historic Significance?

Historic Significance is the importance of the role which a historic property or site plays within an Historic Context. Properties may be significant on a local, state, or national level.

Significant historic buildings sometimes have a very simple design, as seen here along Arch Street.

What Is Context?

A Historic Context is a way to organize information about historic places. Information is grouped together for historic sites and buildings that share a common theme, location, and time period.

cases, federal agencies may directly nominate their own properties).

For properties to be considered eligible for listing in the National Register of Historic Places, they must meet at least one of the four criteria. Some properties may meet some of the below criteria, but still not be eligible for listing unless they meet additional criteria considerations. Examples of these types of properties include properties less than 50 years old and religious buildings.

Properties that meet Criterion A (Historic Trends/Events) for listing in the National Register of Historic Places may be associated with specific important events in local, state, or national history. In addition, properties that meet Criterion A may also be associated with a pattern of historic events or a broad historic trend. Such patterns and trends help explain social developments throughout the course of history. These historic events and trends may be tied to a historic context. In addition, properties and sites eligible for Criterion A should clearly be important within the historic context.

Properties and sites eligible for listing under Criterion B (Important Persons) would be associated with the lives of individuals important and significant in history. The importance that the individual played in local, state, or national historic events or trends should be determined. The accomplishments and history of the individual should be well documented. In addition, the length of association with the individual should also be considered. Finally, the property should be compared to other sites associated with that person's life.

Properties and sites eligible for listing under Criterion C (Architecture) would be considered to demonstrate an important construction method or architectural style, to represent the work of an important designer, or to possess high artistic value. The property may not be a good example of a pure, textbook architectural style, but could still demonstrate an important construction technique. Some buildings may have no discernible style whatsoever but still be eligible as an example of an architectural type.

A group of properties may also be considered eligible for listing under Criterion C if, together, they possess architectural characteristics such as common design elements or a range of architectural styles (although they might not demonstrate these characteristics on an individual basis). This group of sites would be considered a historic district. Other Criteria may also apply to historic districts.

Criterion D refers to significant archeological sites and other obscured resources that, although not immediately visible, have a high potential to reveal important information about human society. These hidden resources may range from a prehistoric

Restrictions and the National Register

Although the National Register of Historic Places is a government program, *there are no special restrictions placed upon the actions of private owners of historic properties.* Such owners, using private funds, may place additions onto, paint, landscape, alter, more or even demolish their historic buildings without first obtaining permission other than what would normally be required by a community. Occasionally, communities have created local historic preservation ordinances and commissions that *do* govern changes made to historic properties.

However, National Register listing does not necessarily lead to the creation of local preservation regulations, and Milton does not have such an ordinance. Because the National Register is a government program, federal agencies—and by extension, their applicants—must consider what effect their actions, or actions they fund, permit, or otherwise assist will have upon National Register-listed or eligible properties.

This Italianate house along Milton's North Front Street demonstrates many important original details, including multi-paned windows and porch columns.

burial mound to a historic building that, though covered by recent additions, has a good likelihood to demonstrate rare and early construction techniques.

Historic properties eligible for listing in the Register may also be Traditional Cultural Properties or places of high cultural importance to Native Americans and indigenous peoples.

Historic Properties in Milton: The Milton Historic District was listed in the National Register of Historic Places in 1986 for significance under Criteria A and C, and with a period of significance covering the years 1800 to 1935. In addition, four other historic buildings or structures in Milton have been individually listed in the National Register. Two of these properties—the Pennsylvania Canal and Limestone Run Aqueduct and the Milton Freight Station—have been individually listed while the Milton Armory was included in a statewide Multiple Property Nomination for National Guard Armories. A fourth property, the Col. James Cameron House, is south of the Borough, and serves as the headquarters for the local historical society.

Milton's train depots now serve as municipal offices.

An early view of Milton's expansion.

2.2.1 Milton's Historic Themes

Early Settlement: Milton's placement on the Susquehanna led to early settlement in the late 19th century. The river was used as a means of trade and commerce, and provided an ideal point of exchange. Marcus Hurling settled the Milton area in 1782 by constructing a tavern near Limestone Run. Andrew Straub arrived in 1779 and would later acquire the land to be used for a settlement in Lower Milton in 1790, which was centered around Limestone Run. Upper Milton, located to the north, was founded in 1795 by Joseph Black. By 1805, Milton's strategic position led to the construction of a tannery, flour mill, carding mill, numerous distilleries, and later, seven hotels. Through its rapid development, the Borough of Milton was incorporated in 1817. Two extant residences (355 South Front Street and 37 West Fourth Street) symbolize the early settlement of Milton and display the fine stonework sometimes used in buildings constructed in the late Federal style.

The remains of Milton's canal aqueduct at Limestone Run.

Canal: The construction of the West Branch Division of the Pennsylvania Canal system provided a transportation alternative to the Susquehanna. A station of the West Branch of the Pennsylvania canal system was constructed in Milton during 1830, and gave the town an opportunity to communicate and trade with other communities across the statewide canal system. Milton's canal station brought an increase in related trade and several canal boat builders located in the town: it brought about substantial industrial growth. Milton took its place alongside great industrial towns of the Northeast with the introduction of an early iron foundry in 1830. In the next two decades, the

town's population doubled and its industrial community added two additional foundries.

Railroad: Through railroad construction in Central Pennsylvania, Milton was linked to a series of Pennsylvania cities and towns well beyond the reach of the Susquehanna, and as a result, the already burgeoning community underwent further considerable growth. Milton's first railroad connection, which was completed in 1852, tied the town to Catiwissa. The line was later expanded in 1855 with a connection to Sunbury, and in 1858 with a link to Harrisburg – Milton was now connected with a wide network of other Pennsylvania communities (it was during this period that James Pollock, a native of Milton, served as governor). In addition to providing the Borough with an alternate and more rapid mode of transport to other parts of the Commonwealth, the railroad increased the rate at which people, ideas, and manufactured goods could travel. As a result, Milton's railroads led to another large population influx and helped to increase its industrial and commercial base. The importance of this transportation system to the Borough was symbolized by the four railways that once served it. Today, the Borough continues to use two historic railroad depots: one as its government offices and the other as a police station.

The 1880 fire was devastating to Milton, but also provided an opportunity to rebuild.

The Great Fire: In 1880, Milton experienced a devastating fire that destroyed 665 buildings. The fire originated in the Milton Car Works framing shop near Locust Street before spreading south to the commercial district along Front Street and to Mahoning Street. The conflagration forced the community to rebuild most of its grandest structures, some of which were rebuilt using rubble from the fire for foundation materials. Many structures, particularly along Walnut Street, imitated aspects of pre-fire architecture, while a diverse collection of grand late 19th century-buildings were built along North Front Street and the downtown commercial district. Because of the fire, Milton has a large collection of Victorian-era architecture. The devastation and dislocation from the fire would only be paralleled by massive urban renewal projects following the flood of 1972.

Industry: Milton has always served as an industrial center, proving true to the origins of its name: "Mill-Town." The Milton Car Works was founded in 1864 and would serve as a major economic force throughout the latter 19th and 20th centuries; railroad cars for the nation are still produced in Milton today by American Car & Foundry. Additional industries included several ventures by the Shimer family in lumber, iron, and machinery; a nail mill owned by Charles A. Godcharles; a cigar factory along Rose Street; knitting operations; brickyards (from which many of Milton's residences and commercial buildings likely received building materials); and the Chef-Boy-Ar-Dee factory opened during the 1930s (still in operation today, the factory is a major employer). Milton's commercial district

Milton's transportation network was an important tool for industrial growth.

along Broadway and South Front Street also evidenced Milton's rise in prosperity following the fire; hotels, three banks, and department stores were all examples of Milton's regional importance.

2.2.2 Milton Neighborhoods

Milton can be defined by its neighborhoods, which form discrete areas in the community.

North Front Street: The residential area of North Front Street extends from Walnut Street north to 8th Street. The neighborhood features many variations of architectural styles from the late 19th and the early 20th century. Several of these residences are associated with important industrialists; contrasting groups of row houses are also located along Front Street. Many residences feature elaborate ornamentation on the front porches and along the cornice. The area displays a high degree of architectural integrity. Unlike several other areas in Milton defined by buildings set close to the lot line, many of the residences along North Front Street feature larger front yards. A canopy of dense tree cover lends the neighborhood a distinct "sense of place." North Front Street borders the river and is a visual bridge between the central business district and communities to the north. North Front Street is residential in nature, with mature and abundant foliage.

Arch/Lincoln: This small neighborhood of primarily residential structures includes a small concentration of post-1880 residential structures along Walnut Street, set to lot line, which display considerable physical integrity. Walnut Street also features two Gothic Revival churches and a neo-classical newspaper building. However, various demolitions have affected the setting of these structures (some are isolated). The area also includes a row of gable-front workers' homes, similar to those in the Center Street neighborhood, facing an adjacent factory. Many of these homes have undergone a loss of historic integrity through recent alterations. The neighborhood boundaries, within the district, include Broadway on the south and Fourth Street on the north, buffered by the American Car and Foundry plant on the east, and the rear alley of Front Street on the west.

Central Business District: Centered along Broadway and South Front Street, the central business district features a variety of late 19th century storefronts and early to mid-20th century storefronts featuring recessed entrances and a range of materials. As is typical with such districts, many original storefronts have been altered with modern materials while the original detailing on the upper floors remains. The district is defined by taller Italianate structures forming a streetwall along Broadway, and a series of 19th century residential/commercial two-story buildings stretching out along South Front Street. Literally built upon the

What about Milton's Churches?

Milton's historic district contains several impressive religious buildings. Under a special criteria exception, some religious buildings may be considered eligible for the National Register of Historic Places.

However, FEMA regulations prevent the use of most project funds for portions of religious buildings that are primarily used for ceremonial or religious purposes. Some portions of religious buildings primarily used for public functions, such as a substance outreach center or soup kitchen, may potentially be eligible for some FEMA-sponsored projects.

Historic community churches are often buildings that display an impressive demonstration of formal architectural styles, and are often important social centers. Many people view community churches as important community landmarks.

Milton once featured streetcars.

rubble of the 1880 fire, the district has traditionally provided a common focal point for commerce and civic activities. Many buildings here played an important role in the Borough's history.

South Front/Mahoning/Lower Market: The residential neighborhood along South Front Street, bordered by Mahoning Avenue, is a working class residential neighborhood. The neighborhood is surrounded by South Front Street to the west, Mahoning Avenue to the north, Ferry Lane to the east, and Apple Street to the south. The neighborhood contains a large collection of Milton's earliest architecture. Physical evidence suggests that several of the homes in the neighborhood predate the 1880 fire, and structures extend from the early 19th century into the 1890s. The neighborhood features houses spaced closely together and set near or at the lot line. While some alteration of historic integrity has taken place (including the use of synthetic siding), these alterations are concentrated along Mahoning Avenue and portions of South Front Street. In addition, five demolished buildings along South Front Street, within the National Register Historic District, have affected the setting of the neighborhood. Historically, this neighborhood is associated with Milton's founding and with its subsequent laboring classes.

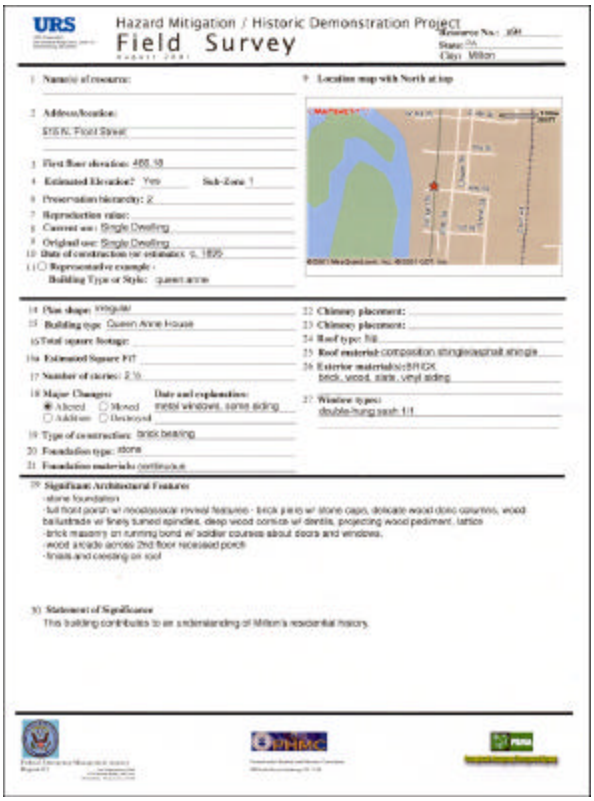
South Front Street is close to the river.

Center Street: The district possesses a consistent streetwall of identical gable-front houses and duplexes built close to lot line with open front porches along the 100 – 300 blocks of Center Street, and a definitive row of duplex homes built up to the lot line along Filbert Street. Other blocks of the district include representative early 20th century vernacular architecture, including six "mail order" homes. While the Center Street neighborhood relies upon its layout as a primary significant visual feature, many of these homes (in the vicinity of 70 percent) have been altered with the use of synthetic siding. However, these homes often retain significant decorative features, including ornament, window casings, etc. Historically, much of the neighborhood was built to house employees working in the Shimer factory, whose owner offered workers financing for housing and approved the design and plan of the neighborhood. The Works Progress Administration, part of President Roosevelt's New Deal, once filmed "Small Town USA," a documentary, along Center Street in the 1930s.

Some of Milton's post -1880 buildings resemble pre-fire construction, such as this house on Walnut Street.

3.1 HISTORIC PROPERTY SURVEY

Although Milton's historic district was listed in the National Register of Historic Places, this survey project required additional information on the location, construction, and historic information on buildings within the historic district. The historic district was surveyed to collect this information.


URS Hazard Mitigation / Historic Demonstration Project
Field Survey

Fieldwork resulted in the gathering of survey data for over 100 buildings located within the floodplain and the 1986 National Register District. In addition, local archival sources, including reverse telephone directories, were briefly inspected. Interviews were undertaken with community members about the town and its historic buildings.

Field survey information was then gathered. In the development of this study, it was not possible to provide survey data for all individual buildings. Rather, it was important that enough information be assembled to identify common trends and patterns. Information was gathered on 100 buildings, representing approximately 15 percent of the Borough's historic buildings subject to flooding. Particular attention was paid to details on the first floor (potentially vulnerable to flood damage). Important information recorded for each property included:

- Foundation material;
- Window material and pattern;
- Siding material;
- Chimney placement;
- Porch construction and placement;
- Roof material;
- Architectural details;
- Square footage (approximated or obtained from tax records); and
- Written description.

In addition, each building was recorded views of elevations and building details. The surveyed focused on a number of buildings that were unique resources and of individual significance to the community. In addition, the survey also recorded buildings that had typical characteristics (such as building materials, architectural form or style). These buildings were not necessarily the most important buildings, and may have been recently altered. Thus, the survey covered a large percentage of "community landmarks" as well as a broad sample of representative buildings. Survey forms for the 100 buildings are included in this report as Appendix A.

This commercial storefront in Milton features unique prismatic glass.

During the survey process, it was determined that different groups of buildings could be distinguished by neighborhood. These neighborhoods had approximate and imperfect boundaries. Neighborhoods were defined by different historical patterns and trends of use (e.g., commercial versus residential), building materials and patterns, and density. An approximately equal number of houses were surveyed in each neighborhood.

Milton's South Front Street neighborhood.

While some of the data gathered in this survey would be used in evaluating the cost-effectiveness of various hazard mitigation alternatives, an additional level of investigation was required. Although the Borough's historic district demonstrated several common themes, some buildings conveyed historic information better than others. To understand the different components of the historic district, the survey team developed a "preservation hierarchy," that would assist in further decision-making efforts.

While such a preservation hierarchy (explained further on page 3-5) may be imperfect (each building for a potential project would still need to be evaluated individually), it would provide a map of potential trends within the historic district. A preservation hierarchy was not intended to provide the Borough with a definitive or ranked list of buildings, but instead with a tool for use in further planning efforts.

An impressive Greek Revival bank building in Milton's commercial district.

In addition, further data and analysis were needed from a subset of surveyed structures. After the structures were divided according to neighborhood context, 30 sample structures were selected from the surveyed structures. Five to six sample structures were selected from each neighborhood. Following the previous survey methodology, these sample structures were representative of other buildings within the neighborhood. Although no established criteria were used to choose structures, they were selected on the basis of preservation hierarchy, type of construction/building form, and location within the floodplain or their potential for risk.

3.2 RISK ASSESSMENT

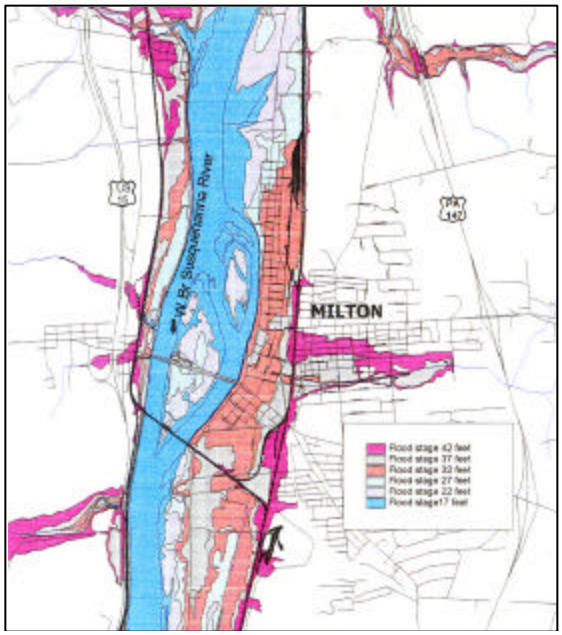
As part of the hazard mitigation project planning process, these 30 sample structures were assessed for their level of risk. An import component in creating hazard mitigation projects is the identification and prioritization of areas which are the most vulnerable to damage from natural hazards.

The level of risk was assessed by evaluating:

- Location of the building within the 100-year floodplain;
- Placement of the first-floor in relation to the flood source (known as First Floor Elevation, or FFE);
- The Reproduction Cost of each structure combined with a standard assumption of interior valuables and goods; this is a

means to quantify the potential dollar value at risk of each property.

Historical anecdotes and written accounts of Milton's long history of flooding had proven useful in developing a historic context. Technical flood data, gathered in part from observation of past flooding events, would be useful in identifying which buildings would be vulnerable to flood-related damage. This data, visualized in flood maps, would demonstrate the predictive behavior of future flooding within the Borough.

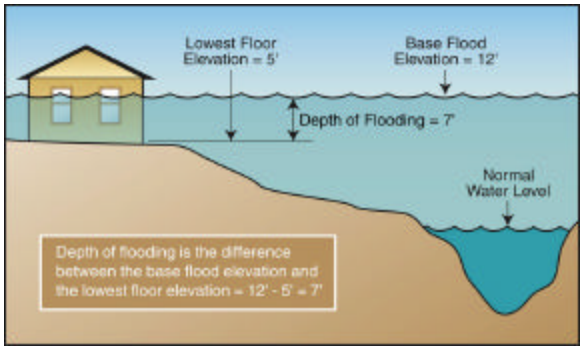


This map demonstrates the different stages of flooding experienced by Milton.

The amount of potential risk for each structure is variable not only on where the structure is in relation to the flood source, but upon the height of the first floor (or in other words, the depth or height of a potential flood). The First Floor Elevation is measured as a constant, fixed number quantifying the number of feet above sea level. The placement of the first floor of each of the 30 sample structures, relative to the river, was obtained through an evaluation of elevation certificates and field observation.

This technical flood data demonstrates both the behavior of flooding in Milton, and the relationship of the First Floor of each building to the flood. Together, these two components would help to identify areas within the historic district likely to experience heavy damage from future flooding. This would allow for prioritization of historic resources based upon vulnerability to damage from flooding.

In addition to identifying *where* historic buildings would experience the most risk, the project partners needed to determine *what* would be damaged by future flooding. The level of risk is also determined by a valuation of vulnerable assets (which include Milton's historic buildings).



Depth of flooding is relative to both the height of the flood and the First Floor Elevation.

This value is a fixed, objective analysis based on building materials and construction rather than the real estate, or "fair market" value. Therefore, a building is analyzed in part based upon its "Reproduction Cost." This would be considered the cost of the building's construction or potential reconstruction.

While there are several methods of determining a fair market value for historic buildings, there was no previously established method for determining a Reproduction Cost for historic buildings. It is a difficult task to value the craftsmanship for historic structures, particularly when materials and skilled labor are no longer readily available. Moreover, historic buildings are treated with a variety of different standards, ranging from standard rehabilitation, to a more careful (and often more expensive) level of museum-quality conservation. The cost of these materials often differs widely in different geographic regions among antique dealers and salvage shops. The most sensible method for determining a Reproduction Cost for historic structures, it was determined, was to place these structures into a

standard valuation format through a common costing guide published by RS Means. Such costing guides place buildings into several different quality categories of per square foot construction costs, based on height and level of detail and craftsmanship.

Because many buildings in the Means guide are somewhat similar in outward appearance to historic structures, it is relatively easy to place buildings into different categories of construction costs; because of their high level of detail, most historic buildings are placed into the higher Means categories. In addition, buildings were modified for local construction costs (which were slightly lower than the national average). Certain exceptions and allowances were created for unique features, such as curved glass windows and turrets.

Commercial structures, due to their unique construction, were analyzed using standard construction costs but were not evaluated through Means. In addition, each per square foot Reproduction Cost was provided a common "historic" multiplier of 20 percent of the Reproduction Cost. The multiplier is a reasonable valuation of the unique, historic characteristics of each structure, and is justified by two standards: 1) income-producing historic structures listed in the National Register are eligible for a 20 percent tax credit if rehabilitated in accordance with standards established by the Secretary of the Interior; and 2) the 20 percent multiplier would account for a potential increase in the repair of historic building materials following a flood. Hence, a reasonable and standardized basis was used to alter the Reproduction Cost.

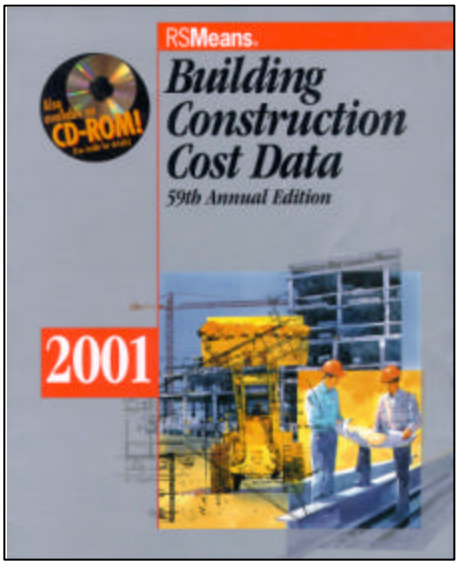
The evaluation of the cost-effectiveness of different hazard mitigation alternatives for these buildings was determined through Benefit-Cost Analysis (BCA), a standard quantitative valuation of potential future avoided damages (considered a benefit). BCA is a nationally recognized method to allow project alternatives to be evaluated. BCA is a method developed for FEMA to evaluate the cost-effectiveness of multiple flood-reduction projects. The Benefit is determined through: 1) the Reproduction Cost of a building; 2) the level of potential risk, which is determined through placement in the floodplain, standard flood data, and the elevation of the first floor; as well as 3) standard damages taken from a national database and cross-referenced with local damages reported to FEMA.

The cost of each mitigation alternative was arrived at through review of standard construction costs and consultation with local building professionals. Costs for relocation (moving of historic structures), elevation, and floodproofing alternatives were determined on a square-foot average basis, with different values for stone, brick, and wood-frame construction. These costs were slightly augmented to anticipate potential increased costs for

What is a Reproduction Cost?

A Reproduction Cost represents the approximate cost of the contemporary reconstruction an existing building. The Reproduction Cost is used in determining the cost-effectiveness of various hazard mitigation alternatives.

In many cases, historic buildings have unique construction techniques and building materials that are impossible to duplicate. This Section provides information on developing Reproduction Costs for historic buildings.



Cost Data books are a common tool in determining Reproduction Cost for hazard mitigation planning.

How Do I determine a Reproduction Cost?

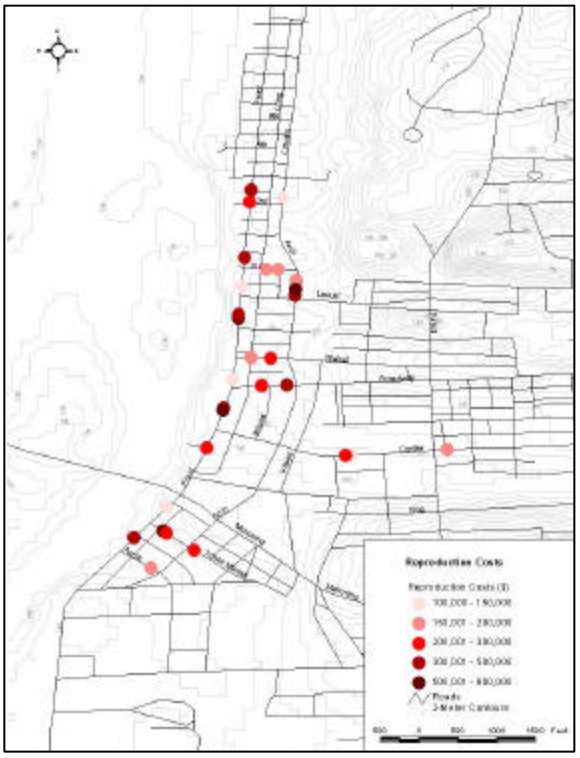
Using a common cost data book:

- Locate the approximate 'style' category by looking for buildings pictured with similar level of ornament and detail.
- Using a basic square foot cost based upon structural system, 'add on' extra costs, such as chimneys and porches. These costs are listed in the guide.
- Find the guide's listing of local construction cost multipliers, and use this figure in calculating the final cost.
- Consider the use of the "historic" multiplier of 20% described in this study.

additional planning and design activities necessary to minimize the potential adverse effect upon historic structures. The estimated cost for acquisition/demolition was arrived at, in part, through an analysis of local property sales for the past several years, and in grouping and averaging costs on a per-neighborhood basis. Other factors included in all evaluations were standard averages for possessions and temporary dislocation. Data from the 1995 U.S. Army Corps of Engineers report referenced previously was used as well. Preliminary investigation of stream channel modifications was undertaken, although a BCA was not produced due to the extreme cost of the alternative; preliminary analysis determined it would not be cost-effective.

The cost-effectiveness of hazard mitigation options, as expressed through Benefit-Cost Analysis, is expressed as a numeric value (called the Benefit-Cost Ratio). A "positive" Benefit-Cost Ratio (indicating that a hazard mitigation alternative is cost effective) would be considered to be 1.0 or higher.

These 30 buildings served as a representative sample of historic buildings the Borough of Milton. They were plotted on a GIS-generated map, and analyzed for the cost-effectiveness of various hazard mitigation techniques. These outcomes were input into the GIS database and depicted on a map. The cost-effectiveness outcome was in turn overlaid on top of the preservation hierarchy. The specific results of Benefit Cost Analysis are further explained in Section Six.



Reproduction Costs for 30 selected structures demonstrate a wide geographic range. Higher Reproduction Costs are shaded in darker colors.

3.3 PRESERVATION HIERARCHY

While all of the buildings listed in Milton's historic district are important to understanding its past, some buildings do the best job in telling the community's history. In many cases, these buildings are directly connected with important persons and events in Milton's past. Other buildings demonstrate unique craftsmanship and construction methods that would be nearly impossible to reproduce. Without its most important historic buildings, the Borough of Milton would lose an understanding of its heritage and its historic "sense of place."

Although it may be a difficult task, it is possible to consider some of Milton's historic buildings to be more historically and/or architecturally significant than others. One way to arrive at this difficult decision is to evaluate the physical integrity of each structure. Simply put, a historic structure does the best job of "telling" its history if it closely resembles its historic appearance. The removal and replacement of important design elements, including windows and siding, may prevent a historic structure from demonstrating some of its historic and architectural themes.

Segmented brick arches are a very common feature on entrances along North Front Street.

This is not to say that structures that have recently been remodeled are less important than others; historic preservation should never be about aesthetic opinion. Instead, a preservation hierarchy highlights the buildings from which the most can be learned about the past. Someday, recent remodelings and alterations might themselves be considered historic. It is also important to note that significant architectural features that appear on a building might not always be from the original date of construction. For example, a building might have been a log cabin house in 1840, and have been remodeled and covered with wood clapboard siding in 1920; it is possible that the wood clapboard would be considered a historic design element and not diminish the structure's physical integrity if the period of significance for the building extended to the year 1950.

Period of Significance

A Period of Significance is the specific timeframe in which a historic property achieved importance on a local, state, or national level.

Another way of determining significance is to identify areas and locations of structures with important historical trends and unique or representative design features. Significant buildings might not always be the largest buildings in town; they might be a row of worker's houses with front porches and set close to the street. Significant buildings might be those easily identifiable with historic patterns and trends, or they could be exceptional examples of an architectural form or style.

Areas of high historic significance include the 0-100 and 100 blocks of Lower Market Street, the 0-100, 100, 200, 400, and 500 blocks of North Front Street, the 100 block of Walnut Street west of Arch Street, and the 100 block of South Front Street. These areas contain a large concentration of highly significant structures. Inclusion in these areas does not automatically grant high historic significance to every building. Conversely, highly significant structures are also located outside of those areas.

This house on 4th Street is one of Milton's oldest, and most flood-prone, structures.

3.3.1 Properties of Importance to Community

Previous surveys and National Register listings have identified several individual properties as places of high individual significance.[8]

In addition to these structures, other buildings may be of high individual significance. In determining the relative historic significance, individual properties included in the survey were assigned a numeric rating, from 1 (highest) to 5 (lowest), for the level of significance. The criteria are explained below:

A designation of "1" defines buildings that are community landmarks. These structures may also have individual significance on a regional, state, or national basis, or are very important examples of design. Such structures would likely have an individual association with historic trends or roles (an excellent example might be a city hall relating to town settlement). The loss of any one of these structures would have a truly devastating effect upon the community.

A designation of "2" defines buildings that fit within established historic and architectural contexts of the district, but have distinctive characteristics that set them apart from the rest of the district. Such buildings might retain an unusually high degree of original fixtures or a locally important example of design. These buildings might be considered the "cornerstones" of the historic district, and their loss would jeopardize the National Register eligibility of the district.

"…it is important to also examine the relationship of one building to the rest of the buildings on the block."

A designation of "3" defines buildings that are common throughout the historic district; such structures display characteristics or building forms/styles typical of the district. Even if such buildings have minor alterations, it is possible to gather important historic information from them.

A designation of "4" defines buildings that share some physical characteristics with "typical" district buildings but have been altered to such a point where some historic information is difficult to extract. Such buildings typically have alterations to the exterior (such as the replacement of siding) but may also have at least one important exterior historic feature remaining (such as an original front porch).

The backs of historic buildings often contain important historic features, and Milton's two-story back porches are a common feature (as seen here along Lower Market Street).

A designation of "5" defines buildings that have been altered so severely that it is difficult to extract important historic information from them. Such buildings typically have numerous alterations relating to the structure (including siding, windows, recent additions) and often relating to the setting (for example, if historic buildings on one side of the street had been demolished and replaced with open space).

Buildings were examined to determine if they possessed architectural elements that are common to the historic district (as opposed to adherence to established form, type, or style), as well as for their ability to demonstrate common historic themes and trends. Buildings associated with prominent persons have already been identified in the Historic District's National Register nomination and were accordingly evaluated. Buildings that are accessible to the public (primarily the downtown buildings and the train depot) were also assigned more importance.

Each structure was individually evaluated for physical integrity and historic significance. The historic significance of each structure is relative to other structures included in the historic district. Therefore, significance is relative to each community. In other words, a categorized count of significant places should yield an approximate "bell curve" of ratings, in which each district has a few highly significant buildings, a larger number of buildings with average significance, and a few buildings of minimal significance.

The numeric number assigned to each building was not the sole determination used in establishing a preservation hierarchy. In a

historic district, it is important to examine not only the individual characteristics and integrity of each structure, but to also examine the relationship of one building to the rest of the buildings on the block.

In addition, to analyzing the architectural history of the Borough, valuable community input about local history was gathered. This input was important in factoring in buildings and places that the community had defined as important and significant structures. Two methods were used in determining community input: a questionnaire, which requested that respondents list significant structures, and a "visual definition survey," an oversized poster where citizens could place adhesive stickers on neighborhoods and areas they identified as highly significant on page 5-1.

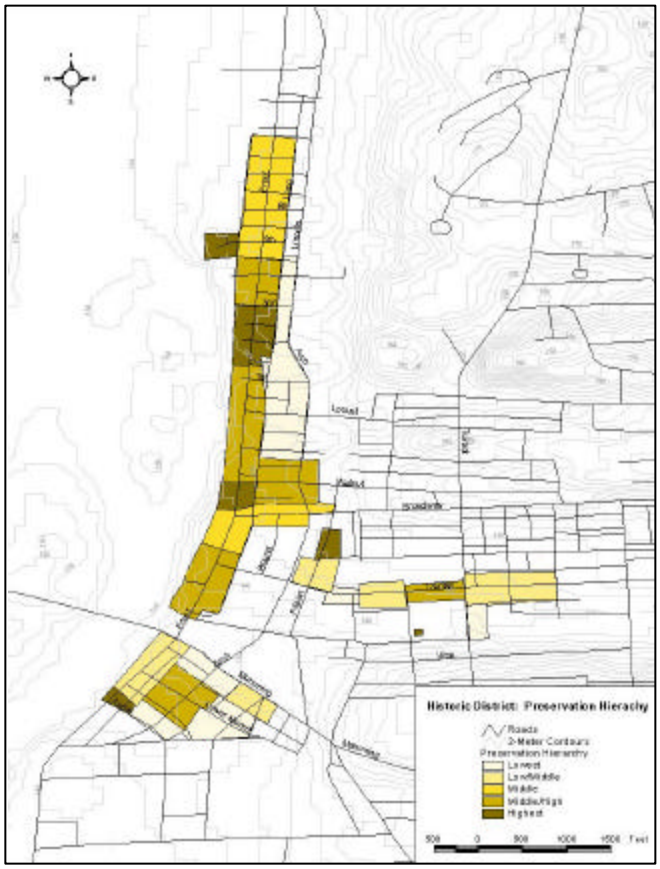
Victorian-era details are featured in this historic row house on Mahoning Street.

After collecting individual hierarchy ratings from the survey, examining panoramic photographs, and cross-referencing both with community input, a block-by-block average hierarchy, rounded to a whole number, can be assigned by the architectural historian based on:

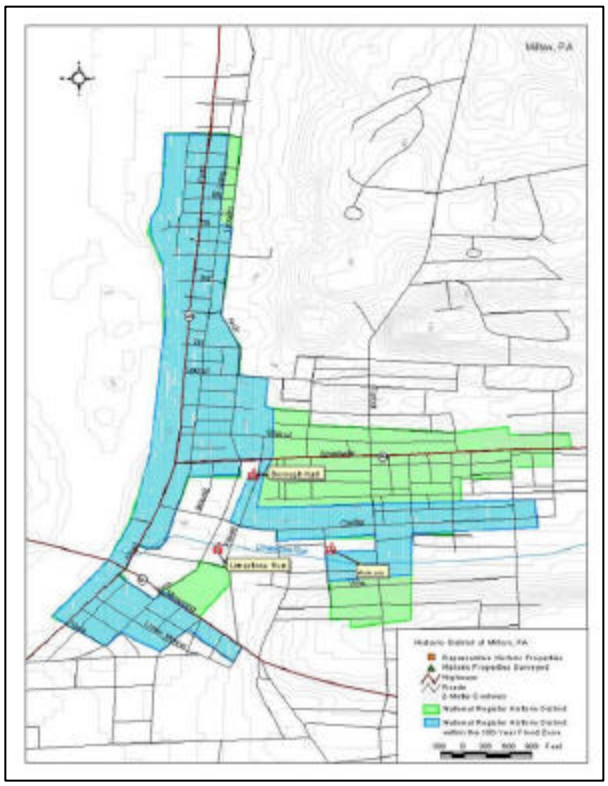
- An exact numeric average of similar and surveyed structures within the block, or proximate to the block when very similar;
- An examination of panoramic photographs and field notes to ensure that the average is accurate, adjusting the hierarchy rating when necessary;
- An examination of community input, to ensure accuracy of findings; and
- Noting locations of individual highly significant structures not in blocks of high overall significance, and adjusting portions of blocks to reflect their presence.

When each block has an identifiable hierarchy average, and highly significant individual structures have been located, a map of the district is shaded and developed on a block-by-block basis. The resultant map will yield a preservation hierarchy, locating areas of high probability for the location of more significant structures.

The final result of the survey and data analysis activities was a map that demonstrated both of the study's objectives: an analysis of historic buildings and of hazard mitigation options. Together, these two sets of data may be cross-referenced. When community goals and input are taken into account, the result is a decision making model that provides a sustainable, historic community with a plan to achieve a greatly reduced risk of flood damage. The specific results the decision making model is further explained in Section Six.



A Preservation Hierarchy for Milton's 100-year floodplain. Areas closer to the top of the Hierarchy are shaded darker.



The blue shaded area of this map represents the portion of Milton's historic district most prone to flooding (within the 100-year floodplain). The green shaded area of this map represents the portion of the historic district within the 500-year floodplain.

One of the objectives of this study was to present a plan for the protection of historic structures while reducing the risk that floods pose to life and property. Too often flood-damaged residences and businesses may have survived a disaster had precautions been taken before the event. Experience has shown that historic buildings that have undergone hazard mitigation improvements, and are well maintained, are more likely to survive a disaster.

"…historic buildings that have undergone hazard mitigation improvements … are more likely to survive a disaster."

This study presents a range of mitigation alternatives, or flood protection measures, that may be used to reduce the effects of flooding on historic properties. These measures range from the acquisition and demolition of buildings, to the elevation of structures, to various approaches to floodproofing.[9]

This guide introduces each flood-protection measure, and discusses its advantages and disadvantages. It also explains the possible impact each measure will have on historic buildings and neighborhoods within the community.

Some of the measures suggested in this study may not be in complete compliance with Milton's floodplain ordinance and/or existing National Flood Protection Insurance Program requirements. It may be necessary to seek input from a qualified engineer and apply for a formal variance for historic structures.[10]

Acquisition and Demolition of historic buildings also affects the setting and character of surrounding properties.

4.1 ACQUISITION AND DEMOLITION

The acquisition and demolition of flood-prone buildings is a highly effective flood mitigation measure. In this method, the community purchases private property, acquires title to it, and then clears the property to create permanent public open space. The process involves disconnecting utility lines, tearing down and removing the building and adjacent structures, restoring the land by filling in the foundation, removing any hazardous materials, and grading the site. When buildings are demolished, care is taken to remove all foundation materials, underground storage tanks, and other potentially dangerous or hazardous materials. By law, the building site, which is now public property, must remain open space land that can be used to create public parks, gardens, recreation areas, and wildlife refuges. Historical markers or other forms of public interpretive devices may be erected on the property as appropriate. However, other than open picnic shelters and restrooms, such land cannot be redeveloped.

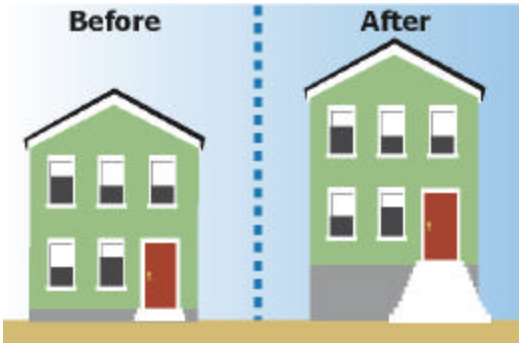
Removal of structures from the floodplain is the most permanent form of flood mitigation. It may also be the most practical solution for buildings that are subject to repetitive flooding and have sustained extensive structural damage. However, the demolition of individual historic buildings or multiple buildings within historic districts should be carefully considered. When a historic building is demolished, it is gone forever; demolition is

an adverse effect on individual buildings *and* historic districts. Also, the indiscriminate demolition of individual historic buildings should be avoided because it can create a patchwork of remaining buildings in historic districts. Finally, if enough historic buildings are demolished, the district's remaining buildings may not possess sufficient significance or integrity for the district to retain its National Register eligibility.

"Acquisition & Demolition is the most permanent form of flood mitigation."

Where it is technically feasible, other options besides acquisition and demolition should be considered for historic structures because acquisition and demolition results in the permanent loss of historic buildings. These options also result in the gradual erosion of the integrity of the historic district. Rather than being demolished, highly significant buildings should always be candidates for other treatment measures such as relocation out of the floodplain or wet floodproofing.

As alternatives to demolition, five additional treatment measures may be appropriate for historic buildings and historic districts: elevation, relocation, wet floodproofing, dry floodproofing for non-residential structures, and the construction of levees and/or floodwalls. Property owners and local governments should consider which of these flood protection measures—or combination of measures—will be most effective for individual needs and community values.



Without proper planning, elevation can have a very dramatic impact on the physical scale of a historic building

4.2 ELEVATION

Elevation is one of the most common methods of protecting a flood-prone building. Elevation involves raising the building so that its lowest floor is above the Base Flood Elevation (BFE), or the 100-year flood zone. The 100-year flood zone refers to the level of flooding that is expected to be reached by a flood having a one-percent chance of being equaled or exceeded in any given year.[11]

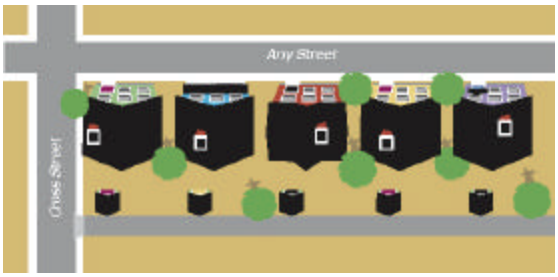
There are several ways to elevate a structure. One is to raise the existing foundation walls using reinforced concrete, masonry blocks, piers, or posts. If this method is chosen, the building is lifted in place using hydraulic jacks, and a new foundation is constructed. The building is then lowered and secured to the new foundation. The elevation method works well for buildings with basements, crawlspaces, and open foundations.

Regrading the ground and landscape after elevation can help retain historic setting and scale.

Elevating buildings built on concrete slab foundations may be easier if the house and foundation are lifted together. The house is left attached to the slab and both are lifted simultaneously. The ground level is then built up using earthen fill or by constructing a new masonry foundation under the structure.

When a building is elevated, the new foundation should conform to historic standards and requirements. *The Secretary of the Interior's Standards for the Treatment of Historic Properties*

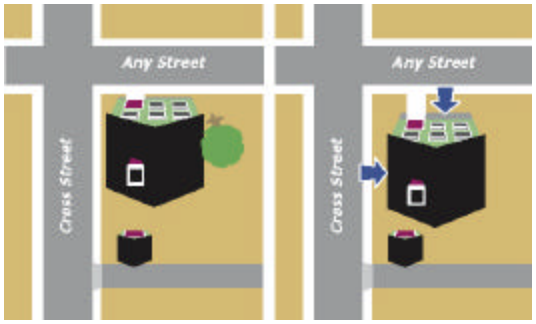
require that whenever possible, distinctive materials, features, finishes, and construction techniques, or examples of craftsmanship that characterize a property should be preserved. By utilizing the Secretary's *Standards*, and trying to maintain the building's setting and scale, it is possible to elevate a historic building and still maintain its eligibility for listing in the National Register of Historic Places.



Historic buildings often share important features such as landscaping, outbuildings, alleyways, and the distance between the buildings and street. These *contributing features* often help to define a neighborhood's historic significance.

Whenever it is necessary to employ modern construction practices, such as the installation of reinforced concrete footings and foundations, new materials should match the old in composition, design, color, and texture. For example, while modern construction might demand the use of poured, reinforced concrete in the foundation for a building with an historic brick foundation, a brick veneer may be used, provided that the mortar and brick match the original in texture and color. Another alternative may be the use of infill sheeting for buildings elevated on piers.

Every effort should be made to replicate or approximate the original scale and setting of the structure. If the building is raised only several feet, elevation would not severely alter the scale. Landscaping may also be a technique to reduce the visual impact of an elevation of a few feet. However, an additional alternative for elevating the structure may include regrading the site, which would entail the placement of fill beneath the building in an attempt to maintain the original physical distance between the building and the grade. Furthermore, elevating a building set within a consistent streetwall (in which the front door opens almost directly upon the sidewalk) would disrupt its relationship to surrounding neighbors (as the building must be set further back to maintain a stairway). A preservation-sensitive alternative would be the elevation of floors within the building; this is a particularly useful alternative for historic commercial structures with tall ceilings. For historic buildings where the basement will be surrounded by fill on all four sides, a special variance for historic buildings from local ordinances and NFIP standards may be required. Therefore, while not all historic structures would make acceptable candidates for preservation-sensitive elevation, it appears that this is a possibility for many of Milton's historic buildings.



Elevation may require a taller entrance; buildings historically set close to the lot line would have to be pushed back (which would alter the historic scale).

An advantage of using the elevation method for historic structures is that it can bring a structure into compliance with floodplain regulations, and may reduce flood insurance premiums, if raised above the BFE. Elevation also reduces flood risk to the building's contents, and may eliminate the need to move belongings to upper floors during a flood. However, elevated houses should not be occupied in a flood event.

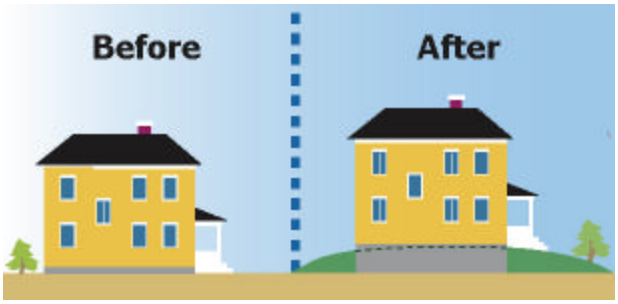
If a building is only elevated a few feet, the introduction of landscaping elements may help minimize the impact of elevation upon historic scale and setting.

Elevation can be a very effective way to mitigate the devastating effects of flooding. The process is relatively cost effective, and a number of qualified contractors are available to perform the

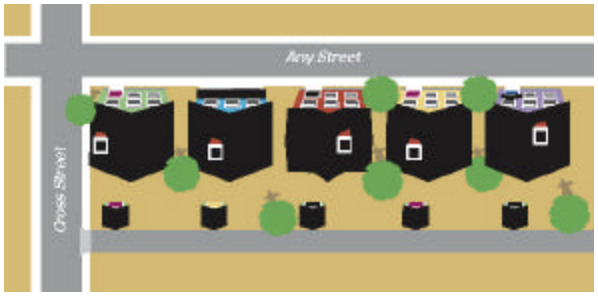
work. The owner of a historic property, however, needs to ensure that the contractor has the experience and qualifications to elevate historic structures, and may need to seek approval from the SHPO before proceeding with the proposed work.

A disadvantage of elevation is that the building remains in the floodplain, and may remain vulnerable to flood damage. Because the foundation walls become higher as the result of elevation, the building may not be able to sustain the effects of high velocity water flows, waves, and fast moving ice and debris. Basement walls, although strengthened, may also be vulnerable to the effects of hydrostatic pressures during a flood event. Whenever possible, basements should be emptied of possessions and filled in during the elevation project. Most utilities today can be safely installed well above the BFE in closets, attics, or attached sheds where they can be further protected. Finally, another disadvantage to elevation is that, pursuant to Section 106 review, this alternative will likely result in an adverse effect to historic buildings, even if they still retain eligibility for listing in the National Register of Historic Places following elevation work.

Therefore, the elevation of buildings in historic districts should be carefully considered. It would not be appropriate, for example, to elevate a single structure without considering the effects that the raised building will have on adjacent buildings or the district as a whole. The effects of landscaping should also be considered. Elevation projects that encompass a neighborhood of structures, rather than a single building, may be more appropriate and aesthetically pleasing.



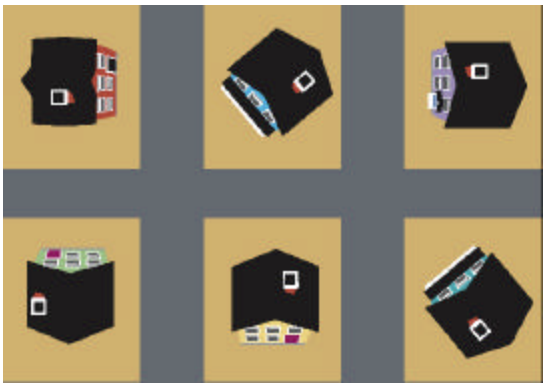
Regrading may help to retain important historic features such as this front porch.



If important contributing features are neglected when historic buildings are relocated, historic neighborhoods may lose their eligibility for the National Register of Historic Places.

4.3 RELOCATION

The most effective way to protect a building from flooding is to move it out of the flood zone. The objective of this hazard mitigation alternative is to move the structure to high ground outside the flood hazard area. If space permits and the new building site meets floodplain regulations, the structure could be moved to a new location on the same property.



Relocation generally involves jacking up the structure and placing it on a wheeled vehicle, usually a heavy-duty flatbed trailer. The building is then transported to the new site and lowered onto a new foundation. Buildings of all sizes and types can be moved, although the costs of relocation can be prohibitive for large, complex structures. In addition, a building must be structurally sound to survive a move, and the transportation route must be carefully planned to avoid obstructions such as narrow roads, bridges with load restrictions, and overpasses.

Relocation eliminates flood risk to the structure and its contents. It may also eliminate the need for the property owner to purchase flood insurance. The benefit of relocation is the added sense of

safety and emotional well-being the property owner may experience by reducing the threat of flooding.

Relocation of buildings is a common practice, and qualified contractors are often available. The easiest buildings to move are one-story frame houses. Multi-story and solid masonry buildings are the most difficult to move because of their greater weight and size. Buildings with stone or brick veneer and houses with chimneys may require extensive bracing to prevent cracking or structural failure.

Relocation of historic houses can be a very dramatic public event.

One consideration that should be made is that relocation can be costly if the homeowner needs to purchase a new lot for the building being moved. There is also the expense of preparing the new site. For example, a new foundation will need to be constructed and utility lines installed and connected. Permits required by local government, highway departments and utility companies may be required. In terms of the former building location, no new structures can be constructed on the lot itself, and ownership of the property would then transfer to the local unit of government.

As defined in the Section 106 regulations, 36 CFR Part 800, moving an individual historic building is an adverse effect, even if the relocated building maintains eligibility for the National Register of Historic Places. Furthermore, the relocation of several buildings within an historic district can have an even greater effect upon the district. Removing a house from its neighbors may leave an inappropriate "gap-toothed" opening in the traditional streetscape. If too many structures are removed from their original locations, not only would the character of a historic neighborhood be seriously compromised, the eligibility of a National Register district may be diminished to the point that the district could no longer remain listed. Another consideration would be whether the new location of the house will be compatible with its period design, and of course, whether the house itself will be compatible its new neighborhood. One option is to relocate historic buildings in groups to new neighborhoods that are historically and aesthetically compatible.

This historic landscape at 4th Street demonstrates the importance of natural elements in creating a "sense of place."

4.4 WET FLOODPROOFING

There are two types of floodproofing: wet and dry. Wet floodproofing allows floodwater to enter the enclosed areas of a building. In contrast, dry floodproofing prevents the entry of floodwater. FEMA has issued regulations for floodproofing (EP1165-2-314, 1995) and has published several Technical Bulletins, 1-93, 293, 3-93, and 7-93, which also provide information on floodproofing.

Wet floodproofing allows floodwater to enter uninhabited portions of the structure, such as crawlspaces, unfinished basements, enclosures below elevated buildings, and attached

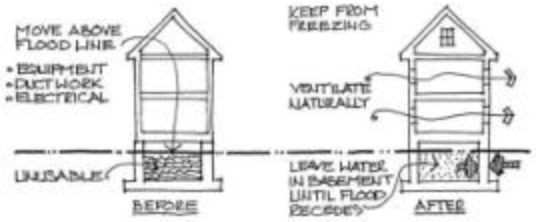
garages. Floodwater is intentionally allowed to enter through specially designed wall openings at ground level that will allow the free-flow of floodwaters. Interior flooding of basements allows hydrostatic pressures on the building's foundation to equalize, thereby reducing the likelihood of structural damage to foundation walls. It is important that floodwater inside the structure be able to rise and fall at the same rate as floodwater outside. Another potential option is to fill the basement with potable water shortly before a flood, which will help to neutralize hydrostatic pressure during flooding.

When a building is designed for wet floodproofing, basement furnaces, appliances, and utilities should be relocated above the BFE. For historic buildings where the first floor will remain below the BFE, a special variance for historic buildings from local ordinances and NFIP standards may be required. In addition, the basement should be completely empty. The basement may be filled in with dirt or sand as part of a wet floodproofing project.

"Floodwater is intentionally allowed to enter…"

Wet floodproofing may also include the elevation of utilities and mechanical systems without foundation improvements. This is an easy and low-cost means of preventing some level of flood-related damage, and has a low level of impact to historic properties.

Wet floodproofing can be an effective way to reduce some flood-related damage to a structure and its contents. This technique is often used when other flood protection measures are too costly, or not feasible. The advantage of wet floodproofing for historic structures is that the exterior appearance of the building is usually not severely altered. However, buildings located in areas of frequent and severe flooding may sustain structural damages that will eventually compromise the safety and integrity of the building.



This diagram demonstrates wet floodproofing methods.

The most obvious disadvantage to wet floodproofing is that the building is not protected from floodwater, which can carry sediment, debris, and hazardous materials including solvents, sewage, pesticides and fertilizers. These materials will require extensive cleanup after a flood. Wet floodproofing also requires human intervention to make it work properly. Foundation wall openings must be maintained and operated by the property owner to allow floodwater to enter and exit the enclosed area. The property owner also needs to exercise caution when pumping out a flooded basement to maintain equalized pressure so that basement foundation walls are not damaged or destroyed. Another disadvantage is that the house should not be occupied during a flood and perhaps for some time afterwards while the remaining water drains from the interior portion of the building and the hydrostatic pressure from sodden soil. In terms of Section 106 compliance, if the foundation wall openings are cut too large or are made in a manner inconsistent with *The*

Secretary of the Interior's Standards for the Treatment of Historic Properties, wet floodproofing may have an adverse effect on historic properties, even while they maintain eligibility for listing in the National Register of Historic Places.[12]

4.5 DRY FLOODPROOFING

Dry floodproofing refers to the sealing of a building's exterior to prevent the entry of floodwater. For historic buildings, a special variance for historic buildings from local ordinances and NFIP standards may be required. In dry floodproofing projects, all windows, doors, and vent openings below the BFE must be sealed either with permanent or removable shields. Additionally, the walls of the structure must be sealed with waterproof coatings to prevent seepage. For this reason, dry floodproofing is practical only for structures constructed with flood-resistant materials, and only where flood depths do not exceed 2 or 3 feet.

"As with all of the flood protection methods that leave the building in place, high velocity water flow, wave action, and fast flowing debris can cause extensive structural damage."

Because dry floodproofing prevents water from entering the building, an equal force does not counter the external hydrostatic pressure exerted against foundation walls by floodwaters. As the depth of water increases, so does the force against the foundation walls. Engineering tests have shown that flood depths greater than 3 feet can cause these walls to collapse. Therefore, dry floodproofing is not recommended for buildings with basements in areas where flood depths are higher than 3 feet. These types of structures are susceptible to excessive hydrostatic pressure if the soil surrounding the structure becomes saturated with water. The result can cause serious damage to the structure due to uplift of the basement floor, collapse of basement walls, or structure buoyancy. Generally, dry floodproofing is only utilized on structures built of reinforced concrete, concrete block, or brick veneer on a wood frame, and may not be suitable for some historic foundations. To prevent backup and flooding inside a building, sewer lines and drains are fitted with backflow valves.

Milton's Elks Lodge (above) under flooding conditions (below).

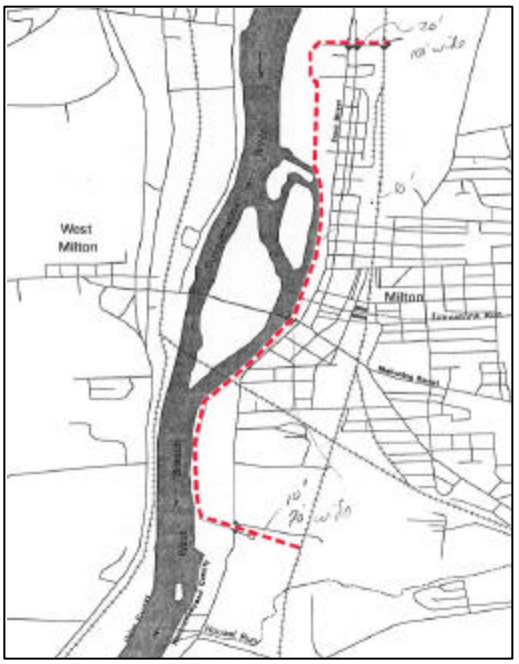
Dry floodproofing can clearly reduce flood risk to a building and its contents. This method may also be less costly than other retrofitting measures. Dry floodproofing may require human intervention to install flood shields in windows and other openings, and the building must not be occupied during a flood event. As with all of the flood protection methods that leave the building in place, high velocity water flow, wave action, and fast flowing debris can cause extensive structural damage.

Dry floodproofing can be a very effective method for certain structures. Aside from wet floodproofing, it may also be the least intrusive of the flood protection alternatives. Another advantage for historic buildings is that the building is left in its original setting. The building's exterior appearance need not be compromised or adversely affected if the waterproofing

materials and flood shields are visually non-intrusive and compatible with the building's historic character.

4.6 STRUCTURAL FLOOD CONTROL MEASURES: FLOODWALLS AND LEVEES

Levees and floodwalls are flood protection barriers. Both function to hold back floodwater, but they differ in their design, construction, appearance, and application. Levees are embankments of compacted soil. They can be built to protect an entire community, such as alongside a river. Levees can be massive in their design, disruptive to a community's relationship to the waterway, and extremely costly to construct and maintain. Smaller, more localized levees or berms can be built to surround a single building or an entire neighborhood. These more modest embankments can often be blended into the natural landscape of the structure or neighborhood, and with proper planning can be appropriate for historic applications. However, levees require a substantial amount of land for their construction and are less practical than floodwalls to protect individual houses.



The dotted line shows the proposed path of a floodwall / levee in Milton.

Floodwalls are typically reinforced concrete and masonry structures. Because of their design and more efficient use of space, they are appropriate for small lots and tight spaces. Floodwalls can also be used in selective locations where flood depths do not exceed a few feet to protect windows, doors, or bulkheads. For this reason, floodwalls are often used in conjunction with other flood protection methods, such as dry floodproofing.

"Levees may also affect the visual character of a community…"

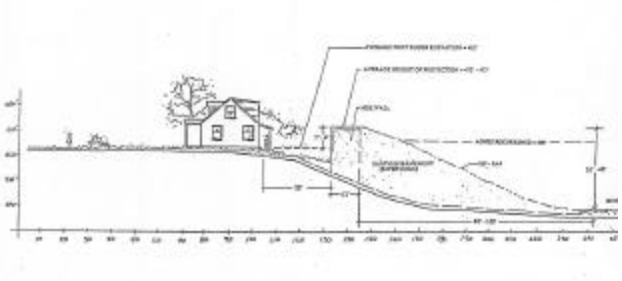
An obvious advantage to levees and floodwalls is the protection they offer to neighborhoods without requiring structural modifications to the buildings themselves. Because the risk to a structure and its contents is significantly reduced, it is possible for a building to be occupied during a flood. However, levees and floodwalls often create a false sense of security when floodwaters are higher than expected. Floodwalls and levees that are overtopped during a flood offer no protection at all. Levees and floodwalls that fail result in high-velocity water flows, which have the potential for massive structural damage. Any openings in the floodwall or levee must be maintained in good working order and manually closed in advance of an expected flood. It is important to remember that floodgates and other barriers must be kept closed until the floodwater recedes. Floodwalls and levees must meet certain requirements in order for FEMA to eliminate flood insurance requirements.

This concrete floodwall in West Virginia demonstrates the visual impact of restricted river access.

The drawback to levees and floodwalls is the high cost required for land acquisition and construction, and once they are built, continuous maintenance is required. Levees and floodwalls may also affect the visual character of a community, as well as restrict access to the commercial and recreational uses of the waterway

not only during a flood, but forever. In this regard, the floodwall or levee may severely compromise both the natural setting and human access to the waterway.

The 1995 U.S. Army Corps of Engineers Baltimore District's *Milton, Pennsylvania: Local Flood Protection Project Reconnaissance Report* concluded that the combined system of a floodwall and levee would provide the greatest amount of flood protection to the community and gave its strongest support to this structural option. The combined system would result in the demolition or relocation of several historic houses, although nearly all of the properties along Front Street would remain in place. The construction of the combined system could disturb an area with a potential for archeological remains, and with a typical height of approximately seven feet, would have an impact upon the setting of Milton's historic buildings.



Typical levee/floodwall section for Milton.

In the U.S. Army Corps report, several alternatives were considered as potential solutions to the flooding problem in the Borough of Milton. These alternatives included both structural and nonstructural solutions. Preliminary plan formulation identified that, due to the severity of flooding, the nature of the existing land use in the floodplain, and the topography, a system of levees and floodwalls could provide a high degree of reliable flood protection. Development in the Borough of Milton is extensive and is located very close to the riverbank. As a result, only two structural alternatives were investigated, each having essentially the same footprint, and including Limestone Run. The two plans provide reliable protection for the 50-year and 100-year flood levels. The 100-year project would protect against a recurrence of an event similar to Tropical Storm Agnes.[13]

Floodwalls and levees may be effective flood protection devices for historic properties because they require little or no structural modifications to the structures themselves. In addition, levees may be sufficiently distant from historic buildings to be completely unobtrusive. Although some Midwestern communities have considered "removable" floodwalls that are constructed shortly before flooding, this is not an option for many communities along the Susquehanna River. It is more difficult to design permanent floodwalls so that they blend into the setting of a historic district. Depending upon the height of the levees and floodwall structures and their distance from historic buildings, they may have an effect and even an adverse effect to historic properties.

A historic view of the Susquehanna River, north of Milton.

4.7 OTHER ALTERNATIVES

Several members of the community, as part of this study's public involvement process, requested that two other alternatives, channel improvements and reservoirs, be considered. These

alternatives may disturb areas with a high potential for archeological resources; the river and island are potentially significant historic resources. These alternatives are discussed below.

4.7.1 Channel Improvements

The 1995 U.S. Army Corps of Engineers study discusses the option of making channel improvements to the Susquehanna River. According to this study,[14] as well as further analysis performed by FEMA in 2001, channel improvements (such as removing the large islands in the middle of the river) would have a very limited benefits, reducing flood levels by less than six inches. The devastating environmental effect of options such as island removal, combined with the high cost, would not make appropriate cost-effective options. The Borough of Milton would still experience substantial risk to flooding once the islands were removed.

4.7.2 Upstream Reservoirs to Store Floodwater

The 1995 Corps of Engineers flood protection report for Milton also discusses the alternative of creating upstream reservoirs to handle flooding on the Susquehanna River. As the report indicates, such reservoirs would be beneficial but would have other disadvantages.[15] However, the high cost and negative environmental impacts would not make this a cost-effective option.

Near Milton, this railroad bridge extends across the river.

4.7.3 Summary of Section 106 Effects According to Treatment Alternative

Table 1 summarizes the potential effects of each hazard mitigation alternative presented in this report. The table compares the potential level of reduced risk with the potential level of adverse effect upon historic properties. An analysis of this table indicates that there is no hazard mitigation alternative that both substantially reduces risk and has a minimal adverse effect upon historic properties. It should be noted that the level of adverse effect as noted in Table 1 was described for hazard mitigation alternatives which have been modified to respect the setting and sense of place of historic buildings.

Table 1: Effect of Hazard Mitigation Alternatives to Historic Buildings in Milton, Pennsylvania

Hazard Mitigation Alternative	Reduction of Risk	Level of Impact to Historic Properties
Acquisition & Demolition	High	High
Relocation	High	Medium - High
Elevation	Medium	Medium
Dry Floodproofing	Low - Medium	Low - Medium
Wet Floodproofing	Low	Low
Stream Channel Improvements	Low	High (archeology)
Levees & Floodwalls	Medium	Medium

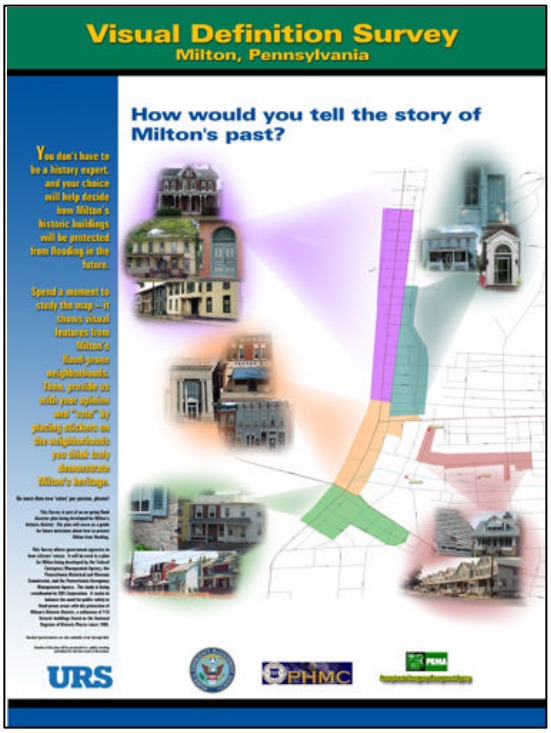
5.1 METHODOLOGY

The demonstration project included an intensive public participation process involving the citizens of Milton. First, three informational meetings were conducted on September 19, October 17, and December 6, 2001. While each meeting was publicized, attendance at each of the meetings was lower than expected. For example, at the first and third meetings, approximately 15 residents were in attendance, and aside from Borough officials, no residents attended the second meeting. Each meeting was advertised by placing notices in the two general readership newspapers that serve Milton, the *Daily Item* and the *Milton Daily Standard*. The final meeting was advertised through the placement of 15-20 posters throughout the community, and through a local radio station.

Despite the low public attendance at the informational meetings, they were valuable for educating the citizens in attendance about the issues involved in the demonstration project as well as receiving input into the planning process from these individuals. Progress reports were made at each of the meetings, and presentations at the second and third meetings included graphic-intensive PowerPoint slide shows. A CD-ROM copy of the most detailed final presentation is included as Appendix C.

As part of the public comment process, a questionnaire was also developed and circulated to gather more detailed information on which historic properties citizens valued and which mitigation alternatives residents preferred. Using a mailing list provided by the Borough government, approximately 600 copies of this form were mailed directly to property owners and residents in Milton's historic district. The deadline for the return of the questionnaires was set at October 31, 2001. However, the questionnaire forms were mailed out before the October 17, 2001 meeting when the project work group (FEMA Region III, PEMA, PHMC, and the Borough of Milton) decided to extend the deadline for comments by one month to ensure greater public participation in the demonstration project. Of the approximately 600 forms sent out, only 22 completed forms were received (see Appendix D). Two forms that had been sent to individuals who had moved but left no forwarding address were returned by the Postal Service.

Finally, an interactive "visual definition survey" was used as another method of obtaining the public's views. This poster was a large storyboard that was placed at various locations around Milton including the Borough Hall and the YMCA, where residents were asked to indicate which areas "best told the community's history" by placing adhesive dots on the poster. Residents placed approximately 54 dots on this poster; this



The Visual Definition Survey provided an opportunity for public input useful in developing a Preservation Hierarchy.

information was then compared to the other comments that were received.

5.2 SUMMARY OF VIEWS

Based on the number of questionnaires returned and the types of comments that have been received, it would be accurate to state that there was no "groundswell" of public opinion. Nevertheless, many respondents have indicated that they have strong feelings about which buildings are important to them. Furthermore, many of the respondents are clearly interested in historic preservation solutions being factored into whatever approach is taken to solve the problem of repetitive flooding in Milton. Somewhat surprising is the fact that a substantial number of respondents indicated that they favored floodwalls or levees being the solution (or at least part of the solution) to the problem of flooding. No respondents indicated that they favored acquisition & demolition more than other alternatives. Several respondents stated that they believed that the Susquehanna River should be dredged to improve channel flow.

"…many of the respondents are clearly interested in historic preservation solutions being factored into whatever approach is taken…"

Recipients of the questionnaire were asked to answer a series of nine questions. These are summarized in Appendix C. Three questions dealt with the issue of what buildings and events were important aspects of Milton's heritage.

Recipients were asked to identify individual buildings and landmark buildings important to community history. Many responded by identifying churches, civic buildings, large commercial buildings, homes along North Front Street, and other buildings.

Recipients were also asked to identify significant events in the Borough's history, and replied by describing the 1880 fire and numerous floods. Industrial development was also identified as a significant event in Milton's history, among other answers.

Recipients were also informed about various hazard mitigation alternatives, and were asked to identify the best solution for the Borough of Milton. Many recipients responded by suggesting floodwalls, dredging of the river, and wet floodproofing, among other answers.

This historic building along South Front Street has a raised foundation.

When planning for hazard mitigation projects in historic communities, such projects should ultimately reflect the priorities of both emergency management and historic preservation. A decision making process could utilize input and data from several different areas, including an analysis of the cost-effectiveness of hazard mitigation options, a preservation hierarchy, and an evaluation of community goals.

In determining the cost-effectiveness of various hazard mitigation alternatives, each property is evaluated based upon the level of risk and the cost of hazard mitigation alternatives.

The cost of each hazard mitigation option is a variable, and is dependent upon location-specific information. As this particular study was produced for planning purposes, estimated and approximated information was used; more detailed, specific proposals would require site-specific estimates and appraisals.

The cost for the structural alternative was provided in a detailed 1995 U.S. Army Corps of Engineers Baltimore District's *Milton, Pennsylvania: Local Flood Protection Project Reconnaissance Report*. The cost for acquisition and demolition was arrived at through an analysis of real estate sales over the past several years. Each neighborhood was researched for past sales, and, through the assistance of Ms. Kate Wieand of C & K Realty in Milton, a mean sales price was used for each structure. Other factors, including relocation, site clearance, and archival recordation, were also factored into the cost.

The cost for elevation of each structure was arrived at through a discussion with Mr. Steve Dziuba of Dziuba House Moving and Raising in Millerton, Pennsylvania. This cost was approximated on a square foot basis for houses of wood frame construction, brick masonry construction, and stone construction; an additional multiplier was factored in for replication of historic detail in new foundations, regrading, and landscaping. Elevation was measured or assumed to be 18 inches above the 100-year floodplain, although variations could occur.

The cost for moving each structure was based upon the elevation cost (as elevation is a significant portion of the cost) with an additional multiplier arrived at through a discussion with Mr. Dziuba. A 0.5 to 1-mile radius and no obstructions (such as bridges) were assumed. It may be assumed that some minor obstructions, such as utility lines, would be encountered. An additional multiplier for advance planning to ensure compliance with *Secretary of the Interior's Standards for Treatment of Historic Properties* was also included.

The cost for floodproofing was determined through a conversation with Shively Electric of Sunbury, Pennsylvania. A dollar figure was arrived at on a fixed fee (rather than square footage) basis, which would allow for substantial elevation of utilities; an alternate figure that allowed for partial elevation was

Historic scale (the space between properties) is an important visual feature.

"When planning for hazard mitigation projects in historic communities, such projects should ultimately reflect the priorities of both emergency management and historic preservation."

also used (with very little variation in results). This dollar figure could also be used for partial structural floodproofing.

By combining the level of risk and cost of various hazard mitigation alternatives, the cost-effectiveness of each mitigation alternative was considered for the 30 representative structures. The cost-effectiveness of each approach could be considered the future amount of damage avoided by various hazard mitigation options. The method of quantitative analysis is formally known as Benefit-Cost Analysis. Calculations factored in the cost of hazard mitigation options, the level of risk, and standardized damage claims from FEMA's national database (cross-referenced with past reported claims for Milton, Pennsylvania). Minor variations in hazard mitigation alternative cost, and reproduction cost, produced little variation in outcome, revealing Benefit-Cost Analysis to be a process weighted more heavily in an analysis of level of risk. Furthermore, as this data was gathered from informal estimates and used for demonstration and planning purposes, actual future hazard mitigation projects would need to include a more detailed and specific analysis of each property's construction and past flooding history. Benefit-Cost Analysis calculations revealed the Benefit Cost Ratio for each alternative. A Benefit Cost Ratio of 1.0 or higher indicates that a particular hazard mitigation option is considered to be cost effective. For planning purposes and visual analysis, the various Benefit Cost Ratios were programmed into a Geographic Information System (GIS) database and rounded up or down into different categories.

An important part of Milton's North Front Street is its historic setting, (such as the canopy of trees shown in this postcard).

Benefit-Cost Analysis of properties in Milton revealed several interesting results:

- For individual structures, there was little overall variation between the cost-effectiveness of different hazard mitigation alternatives. This would indicate that the difference between the cost-effectiveness of acquisition and demolition and that of relocation or elevation was fairly small. Therefore, it may be possible to provide some level of protection against future flood-related damage without demolition of historic structures on a massive scale.
- There were few neighborhoods were trends were noticeable. The neighborhood along South Front Street and Mahoning Street was relatively uniform in high Benefit-Cost Analysis outcome, indicating a high level of risk. The neighborhood along Center Street revealed a fairly uniform low Benefit-Cost Analysis outcome, indicating a lower level of risk. However, variations in data specific to each neighborhood indicated how the differences in Reproduction Cost and size, in construction (brick or frame) as well as variations in First Floor Elevation, might produce very different outcomes for two neighboring buildings. Further, a more detailed Benefit-Cost Analysis might reveal more patterns.

These photographs of North Front Street in Milton demonstrate the potential impact of demolition and elevation upon historic neighborhoods.

- The Benefit-Cost Analysis outcome of floodproofing was somewhat less than that of other hazard mitigation options; revealing that floodproofing is less effective in reducing future damages as opposed to other hazard mitigation options. However, all property owners should be encouraged to take preventative measures, such as elevation of utilities and clearing basements of valuable items.
- The Benefit-Cost Analysis outcome of a structural floodwall/levee was positive. Although no floodwall can absolutely prevent flood damage, and further increased effects are realized by downstream communities, a floodwall might also prevent damage to local industry and infrastructure. However, previous consideration of a structural floodwall indicated that it was far too expensive for the community to consider.
- Stream channel modifications, such as dredging or removing central islands, were analyzed and found to be ineffective in reducing flood levels (flood levels would be reduced by six inches or less) compared to their overwhelming environmental impact and high financial cost.
- Many of the oldest homes experienced the highest Benefit-Cost Analysis outcome. Often the most cost effective option was acquisition and demolition, although this outcome was usually fairly close to the outcome for other hazard mitigation options. This would indicate several potential realizations: a) the oldest properties have a high level of risk; b) the oldest properties were often constructed with less knowledge of repetitive flooding; c) the oldest properties were less likely to have a higher First Floor elevation relative to the ground level; and d) the oldest properties were often constructed very close to waterways.

Although Benefit-Cost Analysis reveals which hazard mitigation options were the most cost effective for each property, the formal analysis cannot be used as the sole factor for creating multiple-property hazard mitigation options in historic communities. Another important factor in the decision-making process would be consideration of identified community goals. Through the public input and participation process, as well as further interviews with community members, several goals were identified as important to the future of Milton:

?? The importance of affordable housing;

?? The maintenance of the population and tax bases;

?? The revitalization of the downtown commercial and business district;

?? The continued support of local industry; and

?? The retention of visual community character.

It is important to consider the impact that hazard mitigation projects can have upon a block of historic structures.

Elevation of a few feet may not significantly alter the historic scale.

Elevation of more than a few feet can significantly alter the historic scale.

Uniform elevation of a block can help to maintain a historic scale.

The decision to relocate a whole community can keep historic buildings intact, but can alter their original "sense of place" without careful planning.

Members of the public who attended the public information meetings stressed that it was important that hazard mitigation projects should be planned to encourage sustainable community and economic growth.

The decision making model developed for Milton, which is applicable to other historic communities with repetitive flooding, uses three factors in choosing multiple-property hazard mitigation models:

1) The cost-effectiveness of hazard mitigation alternatives;

2) The preservation hierarchy, developed to highlight various levels of historic significance; and

3) Community-identified planning goals, as outlined above.

Potential hazard mitigation options should be cross-referenced with the preservation hierarchy. As much of Milton's historic character is dependent upon whole blocks (the relationship of different buildings to each other), projects should be encouraged on a neighborhood and block basis, and should be considered for potential impact to surrounding structures. Hazard mitigation options should be chosen, in part, on the potential level of impact upon historic fabric; in other words, the least intrusive options should be chosen for the most significant historic buildings. Even though more intrusive options, such as elevation or relocation, would likely have an adverse effect to the historic character of buildings, careful planning and adherence to the *Secretary of the Interior's Standards for Treatment of Historic Properties* would ensure that these properties and their district continue to be eligible for listing in the National Register. However, hazard mitigation options that are the least intrusive (those which require the least amount of alteration) should be pursued for the most important community landmarks.

By analyzing 15 selected structures in Milton in detail, a potential model was arrived at which used the higher cost effectiveness of more intrusive options for somewhat less significant structures to balance out the use of less intrusive options for more significant structures.

The result is an overall numeric outcome (or average) which is a Benefit Cost Ratio of 1.0 or higher, indicating a positive overall cost-effectiveness of a project. Two projects are shown here which use a variety of alternatives.

The project balances out some individual structures with a very high Benefit Cost Ratio for a more intrusive project such as elevation (for example, 1.5), with individual structures with a lower Benefit Cost Ratio for a less intrusive project such as floodproofing (for example, 0.5).

Community-identified planning goals were also factored into the decision making process. The revitalization and retention of the

Hierarchy	Neighborhood	Alternative	BCR
2	N. Front	Floodproof	0.42
3	N. Front	Elevate	0.93
3	N. Front	Elevate	0.93
4	N. Front	Elevate	0.57
1	S. Front	Floodproof	0.69
4	S. Front	Elevate	2.83
2	S. Front	Elevate	1.5
3	S. Front	Elevate	1.09
1	N. Arch	Floodproof	0.99
3	N. Arch	Elevate	2.01
4	N. Arch	Elevate	1.34
1	Downtown	Floodproof	0.77
2	Downtown	Floodproof	0.44
3	Downtown	Floodproof	0.44
3	Downtown	Floodproof	0.34

Overall Project BCR ***1.019333333***

This sample project, a potential model, has appropriate cost-effectiveness and uses a variety of preservation-friendly alternatives. (see Page 6-6)

Hierarchy	Neighborhood	Alternative	BCR
2	N. Front	Acquisition	0.33
3	N. Front	Acquisition	0.97
3	N. Front	Elevate	0.93
4	N. Front	Acquisition	0.98
1	S. Front	Floodproof	0.69
4	S. Front	Elevate	2.83
2	S. Front	Elevate	1.5
3	S. Front	Acquisition	1.08
1	N. Arch	Floodproof	0.99
3	N. Arch	Elevate	2.01
4	N. Arch	Elevate	1.34
1	Downtown	Floodproof	0.77
2	Downtown	Floodproof	0.44
3	Downtown	Floodproof	0.44
3	Downtown	Floodproof	0.34

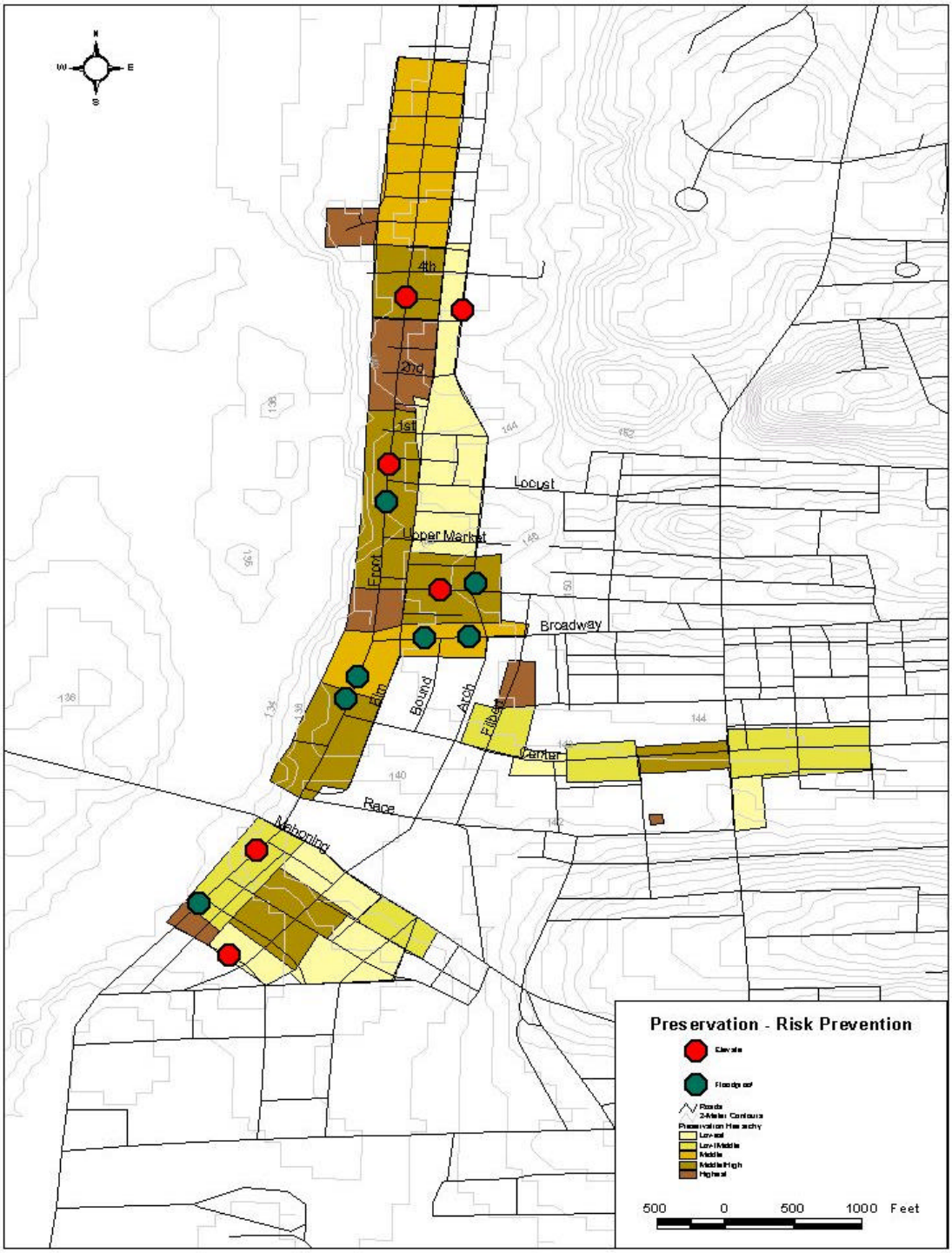
Overall Project BCR **1.042666667**

This sample project has appropriate cost-effectiveness and uses a variety of alternatives, including acquisition & demolition.

Decisions made without regard to other properties have a negative impact on the whole block.

historic commercial downtown neighborhood was identified as a high priority. As most of these buildings extend to the lot line and share party walls, elevation would be a difficult alternative to accomplish. Relocation of such a large neighborhood would likely take place outside of the Borough and result in a loss of tax base. Therefore, funds allocated for various floodproofing measures, even with the potential of elevation of interior floors, would be the most appropriate hazard mitigation alternative. Furthermore, community-identified planning goals were reflected in the attempt to avoid substantial demolition or relocation of historic properties. The physical boundaries of the Borough limit demolition or relocation for a large number of buildings (although this could be pursued on a limited basis) without incurring a loss to the community tax base and population base. All options should limit sprawl outside the Borough borders.

By factoring in community goals, historic significance, and hazard mitigation, the Borough of Milton may choose one or more hazard mitigation projects that will ensure a healthy community able to withstand future flooding, while retaining much of its important historic character. The model for Milton suggests balancing the elevation of several properties combined with floodproofing other properties. This decision making process would be useful for other flood-prone, historic communities in selecting appropriate hazard mitigation projects. Such a decision-making model requires not only careful analysis of a variety of data, but also ongoing community and interagency cooperation.



Preservation Hierarchy & proposed mitigation alternatives of the potential model project. Green "dots" represent floodproofing, and red "dots" represent elevation.

Preservation of historic structures is an important link to the past. By preventing potential flood-related damages, historic properties can be preserved for future generations to actively use and enjoy. Several sources of funds are available for the protection of historic properties in floodprone communities in Pennsylvania. Various state, federal, and private programs provide assistance to local communities and homeowners, although grant funds may be limited in amount. Some of the major programs available to local communities and individual businesses and homeowners are listed below.

Brick arches above windows along South Front Street.

State Programs

The Pennsylvania Historical and Museum Commission: The Pennsylvania Historical and Museum Commission (PHMC) offers multiple funding opportunities to nonprofit organizations and public agencies throughout the Commonwealth. PHMC grants are competitive, with grant awards being made on an annual--and in some cases ongoing--basis. The PHMC has three primary grant programs for the protection of historic properties: Pennsylvania History and Museum Grants, Keystone Historic Preservation Grants, and Certified Local Government Grants.

Pennsylvania History and Museum Grant Program: Funding under this program is designated to support a wide variety of museum, history, archives and historic preservation projects, as well as nonprofit organizations and local governments. Applicants may apply for grants that cover every aspect of historic preservation, including the restoration and rehabilitation of historic structures. Further information is available at www.artsnet.org/phmc or by calling 717.787.4363.

Keystone Historic Preservation Grant Program: Funding under this program is available to nonprofit organizations and local governments for preservation, restoration and rehabilitation of historic resources listed in or eligible for listing on the National Register of Historic Places. The maximum award for this grant program is $100,000. Matching funds are required. Further information may be obtained by calling the Historic Preservation Grant Administrator at 717.772.5071.

"By preventing potential flood-related damages, historic properties can be preserved for future generations to enjoy."

Certified Local Government Grant Program: Funding under this program is limited to federally designated Certified Local Governments (CLG). Funding is available for cultural resource surveys, National Register nominations, technical and planning assistance, educational and interpretive programs, staffing and training, and pooling CLG grants and third party administration. The maximum award is $25,000. Matching funds are required. Further information is available from a Certified Local Government Grant Administrator at 717.787.0771 or 717.783.2838.

Pennsylvania Emergency Management Agency

The Pennsylvania Emergency Management Agency (PEMA) provides disaster assistance to local communities and hazard mitigation grants to residents and business owners. Through the Stafford Act, PEMA administers many of FEMA's funding programs. Two federal programs administered by PEMA are:

Gable-front houses along Turbot Avenue.

Hazard Mitigation Grant Program: The Hazard Mitigation Grant Program (HMGP) provides grants to states for their use in conducting mitigation activities, implementing state or local hazard mitigation plans, and to provide funding for mitigation measures in disaster-prone areas. Funding for the Hazard Mitigation Grant Program is set at 15 percent of the total federal disaster assistance grants made under a presidential declared disaster. Individual property owners should contact their local jurisdiction for application procedures. Further information is available on PEMA's homepage at www.pema.state.pa.us or by contacting PEMA's Hazard Mitigation Office at 717.651.2145. Information on PEMA grants and services is also available from the Grants Administrator at 717.651.2014.

Emergency Management Performance Grant Program: Formerly known as the State and Local Assistance Program, the Emergency Management Performance Grant Program (EMGP) is another potential sources of funds. A federal program that is administered by PEMA, EMGP's purpose is to encourage communities to develop comprehensive disaster preparedness and assistance plans, programs, and capabilities. Congress appropriates funds for the EMGP program, and grants are available on a 50 percent matching basis. Additional information about this program may be requested from a grant administrator at 717-651-2035.

Other State Programs

Sound Land Use Advisory Committee: As a result of Executive Order 1999-1, Governor Tom Ridge called for the identification of sound land use policies and objectives to promote the best land use practices across the Commonwealth. PEMA continues to work with the Sound Land Use Advisory Committee as it developed its report "Land Use in Pennsylvania: Practices and Tools – An Inventory." Additional funding directions and potential sources relating to land use planning may also be sought though the Governor's Center for Local Government Services. Further information is available at the Center's Web page: www.inventpa.com.

Milton's front porches are an important feature, as seen along Center Street.

Pennsylvania Main Street Program: Numerous communities in the state have participated in the Pennsylvania Main Street Program, which has been a valuable mechanism for the revitalization of historic downtown areas. An important part of the Main Street approach to downtown revitalization involves the rehabilitation of downtown façades. In addition to assisting

communities in improving the appearance of their downtown areas and promoting historic preservation, the program has also been an economic stimulus in that it has led to the creation of new businesses and jobs in these communities. Further information is available at the Program's Web page: www.padowntown.org.

Federal Programs

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) provides help to states and communities for flood disaster assistance and hazard mitigation activities under the following programs:

Hazard Mitigation Grant Program: FEMA's Hazard Mitigation Grant Program provides grants to states for their use in conducting mitigation activities, implementing state or local hazard mitigation plans, and to provide funding for mitigation measures in disaster-prone areas. Funding for the Hazard Mitigation Grant Program is set at 15 percent of the total federal disaster assistance grants made under a presidential declared disaster. Individual property owners should contact their local jurisdiction for application procedures. While this is a FEMA program, it is administered by the state.

Historic window features are important historic details often vulnerable to flood-related damage.

Flood Mitigation Assistance Program: Funding under this program provides grants to states and communities to plan and carry out activities designed to reduce the risk of flood damage to structures covered under the National Flood Insurance Program (NFIP). The program provides planning and project grants for projects that include mitigation activities that are technically feasible and cost-effective, and proposed activities that are cost-beneficial to the NFIP. This is an annual FEMA program with funding levels for each state based upon the number of insured properties in that state.

Repair and Restoration of Disaster-Damaged Historic Properties: Funding is available to evaluate the effects of the repair and restoration of disaster-damaged historic structures. Assistance is aimed at mitigating future damages and saving historic structures for future generations to enjoy.

Increased Cost of Compliance: Increased Cost of Compliance (ICC) funding is available to applicants covered by a Standard Flood Insurance Policy under the National Flood Insurance Program (NFIP). ICC provides funding to insured, substantially damaged structures, which are to be elevated, and is limited to $15,000 per structure.

Disaster Housing Program: The Disaster Housing Program provides assistance following a major disaster declaration to address disaster-related housing needs for homeowners. Funding is available for temporary housing and emergency repairs to

make a residence livable until more permanent repairs can be made.

Community Disaster Loans: Community Disaster Loans are available to local governments that have suffered substantial losses of tax and other revenues as a result of a major disaster. Loan proceeds must be used to maintain existing governmental functions or to expand such functions to meet dsaster-related needs. The loan cannot be used for capital improvements or the repair or restoration of damaged public facilities.

All FEMA funding programs are administered through the Pennsylvania Emergency Management Agency (PEMA). Further information on FEMA funding programs may be obtained on the World Wide Web at www.fema.gov or www.pema.state.pa.us.

This house on North Front Street features an elaborate front porch.

Other Federal Programs

Community Development Block Grants: Community Development Block Grants (CDBG) are administered by state community development agencies and local governments on the behalf of the U.S. Department of Housing and Urban Development (HUD) to provide decent housing and a suitable living environment, principally for low-to-moderate-income individuals. CDBG activities may include the acquisition, rehabilitation, and reconstruction of disaster-damaged properties and the redevelopment of disaster-affected neighborhoods. Additional information is available at:

http://www.huduser.org/periodicals/rrr/cdbg.html.

The Pennsylvania Office of Community Development, Department of Community, and Economic Development is responsible for the administration of state CDBG funds. Further information is available at

www.inventpa.com/docs/Community_Resoruce_Directory.pdf.

Historic Preservation Fund Grants-in-Aid: Historic Preservation Fund Grants-in-Aid are provided by the U.S. Department of the Interior, National Park Service for the identification, evaluation, and protection of historic properties. These grants are awarded through State Historic Preservation Offices (SHPOs) for survey and planning activities, and in some instances, for improvements to historic properties through matching "acquisition and development" grants. Further information is available at www2.cr.nps.gov.

In addition to the above grant program, owners of income-producing historic buildings may also be eligible for the federal historic preservation tax credit, which is applied to historic properties that have undergone or will undergo a substantial rehabilitation following *The Secretary of the Interior's Standards for Rehabilitation*.

National Resources Conservation Service: The National Resources Conservation Service (NRCS) provides planning assistance for watershed protection projects, water quality improvement projects, wetland preservation, and management for agricultural and rural communities. Further information is available on the NRCS's homepage at www.nrcs.usda.gov.

Small Business Administration: The Small Business Administration (SBA) provides low-interest disaster assistance loans of up to $200,000 for the repair or replacement of a primary residence; low-interest loans of up to $40,000 for the repair and replacement of household and personal property; and low-interest loans of up to $500,000 for business owners and nonprofit organizations for the repair, rehabilitation, or replacement of property. SBA assistance is generally available following a major disaster declaration. Further information is available on the SBA's homepage at www.sba.gov/disaster.

These historic row houses along Mahoning form a close community.

U.S. Department of Energy: The U.S. Department of Energy (DOE) Technical Assistance Program provides services to communities for the revitalization of single-family, multi-family, and commercial buildings. DOE staff are experienced in performing housing assessment needs, and in identifying financing mechanisms, especially those that include funds for energy efficiency. Further information is available on the DOE's homepage at www.energy.gov.

Another DOE program, the Department's Center for Excellence for Sustainable Development, works with communities to help them define and implement sustainable development strategies as part of their comprehensive community planning efforts. The Center provides technical assistance to disaster-affected communities as they plan community-scale long-term recovery efforts, including relocation, repairs, and reconstruction by introducing a wide array of environmental technologies and sustainable redevelopment planning practices. Further information is available by visiting the DOE's website: www.energygov/environ/index.html.

U.S. Environmental Protection Agency Office of Water Pollution Control: The U.S. Environmental Protection Agency (EPA), Office of Water Pollution Control, helps to establish and maintain adequate measures for prevention and control of surface water and groundwater pollution. EPA programs are designed to protect the quality of ground and surface water to ensure the safety of water sources for future generations. Further information is available on the EPA's homepage at www.epa.gov.

Private Assistance

National Trust for Historic Preservation: The National Trust for Historic Preservation (NTHP) assists individual historic

property owners with financial help and advice. The NTHP provides low-interest, short-term loans for property stabilization. Grants of up to $5,000 are also awarded to governments, nonprofit organizations, and private property owners for professional assistance in rehabilitating historic structures. Further information is available on the National Trust's homepage at www.nthp.org or by contacting the Northeast Office of the National Trust at 617.523.0885.

8.1 THE BOROUGH OF MILTON

A central finding of this study is that a number of possibilities exist for how the Borough of Milton may choose to proceed beyond this study. Two actions for consideration at the local government level include:

- The formation of a citizen-based task force to further refine ideas presented in this study. This group would include concerned citizens, representatives of the business community, owners of historic properties, industry leaders, bankers, and other local decision-makers; and
- The exploration of obtaining state or federal funding to create a new "flood coordinator" position at the local level. The coordinator's list of responsibilities would include the refinement and expansion of the work initiated in this study.

As discussed above, numerous sources for funding exist and the Borough should initiate efforts to explore which of these funds would best serve community needs and goals.

Milton coexists with the Susquehanna River.

Formal Agreement: Project partners, possibly including the Borough of Milton, may also wish to develop a new process or mechanism to streamline the Section 106 process for reviewing FEMA-assisted projects through a formal agreement between the Borough and different agencies (including project partners). The formal agreement would provide a legal and binding statement under which the Borough and project partners would agree to follow the planning process (as outlined in this report) to arrive at hazard mitigation projects. That process would utilize public input and consider a variety of hazard mitigation alternatives (which are analyzed for cost-effectiveness and for potential adverse effect to historic properties). Such an agreement might take the form of a Programmatic Agreement among different agencies (the Agreement could be instituted on a statewide basis, covering many communities, or on a local basis, covering one community), or a project-specific Memorandum of Agreement or Memorandum of Understanding which would be local in scope. It would be important for any formal agreement to systemize the recommended decision-making process, illustrated on page E-5, developed for this study. In general, formal agreements are developed to govern certain types of federally assisted programs, especially when effects to historic properties are similar and repetitive. A formal agreement may include the following topics:

Milton's citizens take part in clean-up efforts following the 1975 flood.

More detailed information regarding a formal Agreement may be found in Appendix E of this document.

- A process for updating historic building survey data for both National Register-listed Historic Districts as well as for individually listed or eligible buildings;
- A process for identifying and evaluating archaeological sites;

- The hierarchy of historic buildings such as the one developed for Milton;
- Cross referencing the hierarchy proposed in this study with FEMA's Benefit-Cost Analysis (which will be used to determine the cost effectiveness of each hazard mitigation alternative);
- Evaluation of a hazard mitigation project's effects on community goals;
- Assessment of effects of hazard mitigation projects on the historic character of the overall historic district (or specific neighborhoods within the historic district);
- Identification of historic properties and assessment of effects would need to be handled by one or more professionals who meet *The Secretary of the Interior's (Historic Preservation) Professional Qualification Standards* contracted or employed at the local level (or assisted through other regional planning organization, such as SEDA-COG). In certain cases, and depending upon the professional's expertise, this individual could review local hazard mitigation projects;
- A locally based historic preservation planner could also assess a proposed hazard mitigation project's effect on surrounding streetscapes and neighborhoods, and then render an opinion. The goal of the project work here would be to undertake hazard mitigation in a way so as not to damage historic properties by following *The Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties*;
- A list of standard historic preservation (Section 106) mitigation measures for adverse effects to historic properties; these might include measures such as recordation photography and salvage of architectural elements;
- A list of nonstandard historic preservation (Section 106) mitigation alternatives for adverse effects to historic properties, such as FEMA funding, to assist in other goals (for example, the continued survey of historic properties in Milton);
- Possible funding programs that could be used to implement goals of the study. As discussed above, many options exist;
- Any other initiatives for continued interagency integration among the Borough, FEMA, PEMA, and PHMC.

There are several benefits offered by a formal interagency agreement. First, much of the preliminary work required by the standard Section 106 review (such as the serious consideration of preservation-friendly alternatives, and public input) is integrated with the hazard mitigation planning process; the consideration of preservation-friendly alternatives is at the beginning, rather than end, of the process. Second, some of the cumbersome, project-

Rebuilding Milton after the Fire of 1880.

Historic Preservation (Section 106) mitigation alternatives for adverse effects to historic properties are agreed upon actions that will be taken to 'offset' the impact of projects that will harm historic properties.

by-project review work required under the Section 106 regulations is eliminated. Third, local governments such as the Borough of Milton can group projects together to better balance the goals of hazard mitigation and historic preservation through the selection of less damaging mitigation alternatives when locally significant historic buildings are involved. Planning and project selection is a locally based process. Fourth, the use of a formal agreement should result in ongoing public involvement and comment into local hazard mitigation decision-making that ensures the community's views regarding its heritage are continuously inserted into the Borough's planning process for hazard mitigation projects. This last point is important. Because a formal agreement will largely substitute for the standard Section 106 review process, it will also be necessary to include provisions in the document that involve additional public participation efforts and coordination.

An early view of Milton's Broadway.

While they are not necessarily disadvantages, several considerations should be noted by all parties and agencies in any decision to enter into a formal agreement. First, before a formal agreement can be put in place, such an agreement must be initiated by the Borough, but with the leadership of FEMA, which would request the involvement of PHMC, PEMA, and the Advisory Council on Historic Preservation in Washington, DC. Second, the degree to which an agreement would grant autonomous reviews to the Borough will depend completely upon the assistance of the local historic preservation architect, preservation planner, or preservation engineer meeting the necessary professional qualifications recommended by the National Park Service. For example, the more qualified the preservation specialist, the more autonomous the Borough's role will be in the review of its projects.

Historic stone construction in Milton.

Third, the autonomy of the Borough to carry out hazard mitigation projects under a formal interagency agreement will further depend upon whether these projects avoid adverse effects to historic properties. For example, if the historic preservation specialist determines that a proposed hazard mitigation project would result in no adverse effect on historic properties, then no SHPO review may be required. Likewise, if the local reviewer determined that a proposed hazard mitigation project would result in an adverse effect, but that the project would also follow certain historic preservation treatment standards, the project would need to be reviewed by the SHPO for a previously established set period of time (perhaps 15 working days). However, if the local reviewer determines that a proposed project would result in an adverse effect that could not be minimized or avoided, then formal Section 106 review would need to be initiated.

8.2 ENHANCED HAZARD MITIGATION GRANT APPLICATION

One alternative to a formal agreement would be for local communities such as Milton to provide answers to a series of questions on a Hazard Mitigation Grant Application. An enhanced Grant Application would not necessarily require local communities to follow the decision-making process outlined in this study, however, local communities would have to provide more detailed answers regarding historic properties. Specifically, local communities would have to describe the anticipated impact of hazard mitigation projects on historic properties, and would be asked to clearly justify the cost-effectiveness and community benefits realized by such projects. Local communities would also be asked to describe any opportunities for public input.

These questions for enhanced Grant applications are listed in detail in Appendix F.

Milton's historic commercial center.

8.3 INTERAGENCY COORDINATION

In addition to the recommendations made to the Borough of Milton, several findings are also offered to FEMA, PEMA, and PHMC to continue interagency integration of land use planning efforts. Together, PEMA and PHMC have participated in several cooperative efforts, including interagency staff sharing during natural disasters, and both agencies participated a Memorandum of Agreement in June of 1999 to create the Pennsylvania Geospatial Information Council.

Continue Interagency Coordination: Close information-sharing and coordination between the three agencies should be continued not only with respect to Milton but also in general for hazard mitigation work to be undertaken throughout Pennsylvania.

The difficulties associated with limited interagency coordination were highlighted during the June 1997 National Park Service (NPS) and Association for Preservation Technology (APT) Symposium *Management of Disaster Mitigation and Response Programs for Historic Sites: A Dialogue*, which was held in San Francisco, California.[16] At this conference, several general areas of improvement were identified that could help overcome past problems in coordination between disaster management and historic preservation specialists including:

- Greater standardization in FEMA compliance with historic preservation laws;
- Increased education (both public and professional);

Flooding near the Post Office, along North Front Street, in the 1960s.

- Improved communications between the State Emergency Management Agency and the State Historic Preservation Office; and
- Greater sensitivity displayed by the State Emergency Management Agency and the State Historic Preservation Office toward non-European cultures, particularly Native Americans.

Expand Educational Opportunities: Professional education for emergency management staff in historic preservation practices, and education in disaster and emergency management for preservation professionals, are both critical in bridging the philosophical divide between the two professions. The wrong time to begin this education process is after a disaster has occurred and recovery efforts are underway.[17]

The logical outcome of education, agency cooperation and coordination, and information sharing is the creation of a network of professionals—from both disaster management and historic preservation, from the private and public sectors, from the federal, state, and local government levels—that work together in the aftermath of disasters.[18]

The Standard-Journal Building along Arch Street is an impressive example of neo-classical architecture.

Continue to Improve Communication: Working in tandem with professional education, another important improvement to the relationship that exists between disaster and cultural resource managers is better communication. Increased pre-disaster interaction will create more effective hazard mitigation projects in disaster situations.[19]

Hold Quarterly Meetings: An extension of both continued coordination and improved communication between the three agencies would be for FEMA, PEMA, and PHMC to hold quarterly meetings. Rather than discuss specific projects, however, the subject of these meetings would be the discussion of issues that each of the agencies is facing in their coordination with each other. Such meetings will increase the level of understanding that already exists between the agencies, but may also help to foster a greater sense of "common cause" for the participants.

Milton during the 1894 flood.

Increase Existing Interagency Activities: Another way that the two state agencies could create a higher level of mutual understanding would be for each agency to invite the other to participate in reviewing its broad agency mission goals or plans. For example, PEMA could request that PHMC review and comment on its statewide disaster plan so that historic preservation goals can be better integrated into hazard mitigation work undertaken in Pennsylvania. Similarly, PHMC could ask PEMA to review its next statewide preservation plan and offer its suggestions on how historic preservation objectives could reflect. To be the most effective, this coordination should be continued on an annual basis.

Expand Historic Preservation and Emergency Management Capabilities in Pennsylvania: FEMA and PEMA might also consider providing funds for a new, in-house staff person with expertise in historic preservation to be employed within PEMA. Another option would be for PEMA to provide funding for an emergency management program-specific position within PHMC. In several states, transportation and community development agencies have entered into cooperative agreements with their SHPOs where these agencies provide funds for a SHPO staff review person who serves the function of reviewing the agency's projects and providing comments required under Section 106 consultation process.

If state funds are unavailable, PEMA and PHMC could continue to share staff during disaster recovery efforts. For example, through the Stafford Act, FEMA could provide disaster funds to the SHPO to hire a staff person to help coordinate the review of FEMA-assisted projects. In return, SHPOs could assist disaster recovery work through placing response teams in the field.[20]

An example of neoclassical detailing in one of Milton's finest front porches.

Assist Milton in Implementing Community Hazard Mitigation Goals: Because the Borough of Milton will continue to need technical assistance in implementing its hazard mitigation goals, a further recommendation is for FEMA, PEMA, and PHMC to continue to advise the Borough on potential funding opportunities. Each agency should evaluate its existing programs and determine which of these will assist Milton in carrying out its goals. For example, PHMC could encourage Milton to apply for a survey grant to continue the identification of historic properties in the community. Likewise, FEMA and PEMA may have funds that would enable Milton to establish either the flood coordinator or historic preservation specialist position so that the community will have the Borough-based evaluation capability necessary under a formal interagency agreement.

That FEMA should provide such leadership to local governments is borne out by at least one national study. One of the recommendations that appeared in the University of Delaware's Disaster Research Center report *Disaster Resistant Communities Initiative: Focus Group Analysis* was that FEMA should help communities locate alternative funding sources.[21]

Milton is one of many historic Pennsylvania communities with a close relationship to the Susquehanna River.

Another recommendation would be to create and include a funding section in appropriate volumes of the FEMA "How To" Guide series. This series, initiated by FEMA in 2001, is designed to provide community-based guidance involving emergency management projects.

Also, FEMA offers funding to state and local governments for training and education in comprehensive emergency management[22]

Applying Milton Model to Other Pennsylvania Communities: Because the model developed for Milton can be replicated, a final recommendation is for FEMA, PEMA, and PHMC to explore using the decision-making model on other flood-prone communities in Pennsylvania. In addition, the model could be used to develop a state-based Programmatic Agreement or other types of formal agreements between government agencies. The project partners could study ways for information in this study to be applied to all or some of the 77 flood-prone historic communities in Pennsylvania, and consider how this study may be used to reform aspects of regulatory review, such as Section 106, while simultaneously working with local partners to create safe, sustainable historic communities.

1 Acknowledgements: Project partners included: Gene Gruber and Herb Levy, FAIA (FEMA Region III), Alan Tamm and Piyush Gandhi (PEMA), Susan Zacher (PHMC), Linda Meckley, Malcom Messenger and Doug Diehl (Borough of Milton). Tom Bresenhan (SEDA-COG) also provided comments and information.

Thomas R. Deans and Bill Raup of Milton also provided valuable information about the Borough's history and historic structures. Chris Brady of the Milton Daily Standard served as a local media contact. Kate Weiand of C & K Realty (Milton PA), Steve Dziuba of Dziuba House Moving and Raising (Millerton PA), and Shively Electric (Sunbury PA) also provided useful project cost information. Many residents of Milton participated in public meetings, questionnaire responses, and the interactive Visual Definition Survey.

URS personnel from the Gaithersburg, Maryland office included Mark R. Edwards (Project Manager), Jeffrey Durbin (Senior Architectural Historian), Mary Sayres Dowden (Senior Architectural Historian), Caleb Christopher (Architectural Historian), Richard Rose (Senior Preservation Specialist), Steve Pardue AICP (Senior Planner), Katy Holmes (Architectural Historian), Teresa Chapman (Planner), Lee-Ann Lyons and Billy Rupert (Graphics), and Colin Vissering AICP (Project Coordinator). Ken Goettel & Associates of Davis, California also provided a Benefit-Cost Analysis.

Photographs of Milton's floods were adapted from various commemorative issues of the *Daily Standard* citied in the bibliography, and from the Milton Historical Society. Photographs of other buildings in Milton were adapted from the postcard collection of Jeffrey Durbin or from the URS survey.

2 According to the International Code Council's publication, Reducing Flood Losses through the International Code Series: Meeting the Requirements of the National Flood Insurance Program, federal flood insurance helps homeowners recover from a disaster and seeks to prevent risk to repetitive flooding:

> By encouraging communities to guide development to lower risk areas, and by requiring elevation of new buildings and non-conforming buildings that sustain major damage, one of the long-term objectives of the NFIP can be achieved: *Create disaster resistant communities*. Older buildings may be removed or replaced, or they may be upgraded or modified with techniques that lead to little or no flood damage. Through the land development process, developers can often be required or encouraged to keep new development out of high risk areas (International Code Council 2000:1.2-1.4).

3 According to the International Code Council, some communities encourage new construction to be built with reduced risk to damage from flooding, and the Community Rating System (CRS) provides additional incentive.

> The amount of flood insurance premium discount is based on a community's CRS classification. There are ten classes, with a five-percent discount for each class. Class 10 has no premium discount, and Class 1 yields the maximum discount of 45 percent for policies on buildings in the mapped flood hazard area. A community's CRS classification is based on the number of credit points calculated for specific floodplain management activities undertaken to meet the goals of the NFIP and CRS (International Code Council 2000:3.5).

4 According to the 1995 Milton, Pennsylvania Local Flood Protection Reconnaissance Study prepared by the U.S. Army Corps of Engineers Baltimore District:

> The Borough of Milton has participated in the CRS since 1992, and has a current [as of 1995] rating of 9. One major deficiency for the borough is their lack of an approved Flood Plain Management Plan. . . . It is recommended that the borough prepare a formal Flood Plain Management Plan for uniform and consistent future planning efforts to receive all available credit points under the CRS, as the addition of such a plan would multiply points received in other categories. Currently [in 1995], the borough has a total of 553 CRS points, but by adding a Flood Plain Management Plan and other improvements to bring the total above 1500, the borough could qualify for a rating of 8 and could realize a 5-percent discount in flood insurance premiums (U.S. Army Corps of Engineers 1995:7.3).

5 According to the International Code Council, elevation certificates are used to determine insurance ratings, and are an important item in determining if new construction in flood-prone areas complies with revised building codes. (International Code Council 2000:4.7)

6 In its 1997 report Higher Ground: A Report on Voluntary Property Buyouts in the Nation's Floodplains, A Common Ground Solution Serving People at Risk, Taxpayers and the Environment, the National Wildlife Federation noted that in many cases, demolition, compared with large structural mitigation projects, is far more cost effective and less intrusive to the natural environment (National Wildlife Federation 1997:Higher Ground Report Website).

7 In the Planning Advisory Service of the American Planning Association publication entitled Planning for Post-Disaster Recovery and Reconstruction, Jim Schwab writes that it can be difficult to integrate preservation concerns for historic buildings and their risk to damage from a variety of natural disasters. Post-disaster planning for historic properties should seek a variety of funding sources in addition to FEMA funding (Schwab 1998:105-06).

8 These significant properties may include:

- Limestone Run Aqueduct
- Extant train stations at Filbert
- Armory
- 355 S. Front (Herthington House)
- 940 N. Front
- 744 N. Front

- 700 N. Front
- 500 N. Front
- 419-421 N. Front
- 401 N. Front
- 117 N. Front
- 311 N. Front
- 246 N. Front
- 201 N. Front
- 50 N. Front
- 32 N. Front
- Post Office N. Front
- 28 N. Front
- 20 S. Front
- 225 Turbot
- Library S. Front
- 36 S. Front
- 45 S. Front
- 114 S. Front
- 201 Turbot
- 50 Walnut, First Presbyterian Church
- First Methodist Church
- South Front Street
- 148, S. Front
- 137 Center
- 541 Broadway
- 131 Broadway
- 109 Broadway, St Joseph's Church
- 65 Broadway
- 60 Walnut
- 115 North Front Street (Masonic Temple)
- 37 W. 4th

9 According to the International Code Council's publication, *Reducing Flood Losses through the International Code Series: Meeting the Requirements of the National Flood Insurance Program*, "Base Flood Elevation (BFE) as used by the NFIP, is the elevation relative to the datum specified on the Flood Insurance Rate Map (FIRM) that is expected to be reached by a flood having a one-percent chance of being equaled or exceeded in any given year (International Code Council 2000:1.11)."

Another term used in describing flood elevations is the "Design Flood Elevation" (DFE). The International Code Council defines DFE as "the elevation of the Design Flood, including wave height in coastal areas, relative to a specified datum. The DFE must equal or exceed the BFE in all cases (International Code Council 2000:1.11).

10 According to44 CFR §360.1: Ch. 1 (10-96 Edition)

Part 60 – Criteria For Land Management & Use, Subpart A, 60.6 (Variances & Exceptions) (a)

> "…Insurance premium rates are determined by statute according to actuarial risk and will not be modified by the granting of a variance. The community, after examining the applicant's hardships, shall approve or disapprove a request. While the granting of variances generally is limited to a lot size less than one-half acre (as set forth in paragraph (a)(2) of this section), deviations may occur. …*Variances may be issued for the repair or rehabilitation of historic structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's designation as a historic structure and the variance is the minimum necessary to preserve the historic character and design of the structure*."

11 The 1995 U.S. Army Corps of Engineers Baltimore District *Milton, Pennsylvania Local Flood Protection Reconnaissance Study* described previous efforts to elevate buildings:

> A good example is the elevated house on 6th Street between Arch and Front Streets. . . . The original owner (William Steiner) is no longer living there, but was able to sell the property after floodproofing, and it is currently occupied; another elevated house can be seen on Center Street. . . . Buildings elevated on fill can be seen near Front Street (U.S. Army Corps of Engineers 1995:7.1).

12 The 1995 Army Corps of Engineers *Milton, Pennsylvania Local Flood Protection Reconnaissance Study* generally viewed nonstructural methods to control flooding (including both dry and wet floodproofing alternatives) as favorable:

> The structural approach to flood plain management is the use of measures that reduce the frequency of damaging overflows in the floodplain. The non-structural approach seeks to reduce or avoid flood damages without significantly altering the nature or extent of flooding. There are many effective methods that can be used to modify susceptibility to flood damages. Non-structural measures include flood plain regulations, flood forecasting and warning, and floodproofing. Floodproofing is a viable approach to reducing flood damage that involves altering or adjusting an existing building or properties to prevent or minimize damages during a flood. Alterations may range from making minor changes to utilities, to waterproofing walls, elevating the building above flood levels, or even moving the buildings to a

higher elevation. The potential for floodproofing to reduce flood losses is significant. Many people have floodproofed their homes or businesses, often by using common sense, self-taught approaches. . . .

> Over the last 10 years, Federal, state and local agencies have researched techniques, promoted flood plain management as a viable flood protection measure, and assisted property owners in implementing projects. Studies have shown that financing is often the greatest impediment to implementing a flood protection project. The communities receiving Federal assistance for implementing non-structural measures were able to initiate more thorough and effective flood plain management methods than those who received no funds. Thus, it is important that the community be aware of existing government programs that provide floodplain management assistance. Some of these, such as the Corps of Engineers Flood Plain Management Services (FPMS) Program, offer free technical assistance to communities (U.S. Army Corps of Engineers 1995:7.1).

Moreover, the study also included the following observation:

> Floodproofing has proven to be less expensive than other flood protection measures. However, two cautions must be noted. First, communities should recognize that floodproofing may not stop street and yard flooding, damage to infrastructure, traffic disruption, and other problems that accompany floods. Protecting buildings is often the single goal of a floodproofing protection program. Thus, the quoted damage-dollar amount may not include the indirect costs of other flood-related problems. Second, predicting the actual costs of projects in those areas with little floodproofing experience could prove to be difficult. A homeowner could construct a project at a relatively small out-of-pocket cost, substantially less than if it were to be fully funded by a government agency paying for engineering design and prevailing wages for the contractor. Ideally, a group of homeowners could work together on floodproofing projects to protect their own homes. This solution could be more cost-effective and easier to implement (U.S. Army Corps of Engineers 1995:7.1-7.2).

While it is recognized that some buildings were "not structurally sufficient for floodproofing," the U.S. Army Corps of Engineers noted that "the majority of residential and commercial flood damage in Milton during Tropical Storm Agnes occurred in structures which were inundated by flood waters to a depth of 6 to 8 feet" (U.S. Army Corps of Engineers 1995:4.3). The Corps study described a completed wet floodproofing project in Milton: "Wet-proofing techniques were used on the Christ Episcopal Church . . . on Upper Market Street where the structure was reinforced and the contents made removable for evacuation" (U.S. Army Corps of Engineers 1995:7.9).

13 The U.S. Army Corps of Engineers' 1995 *Milton, Pennsylvania Local Flood Protection Reconnaissance Study* included a structural alternative and described the approach as follows:

> The Milton, Pennsylvania, Local Flood Protection Project is located along the east bank of the West Branch Susquehanna River in Northumberland County, Pennsylvania. Two levels of flood protection were investigated for potential projects: 50-year and 100-year protection. The footprint for both levels is essentially the same and would require the same real estate actions. Both projects entail the construction of 12,560 linear feet of levee and 3,200 linear feet of riverside levee with a mechanically stabilized earthen (MSE) wall. The proposed protection would run primarily along the east bank of the river behind the existing structures along North Front Street. Due to the proximity to the river of the buildings along Front Street, the levee has been designed to extend into the river upstream of the Route 642 bridge. This will allow riverbank structures, several of which have historic value, to remain in place. A total of four closure structures are required.
>
> Two closure structures are required at either end of the levee where it crosses Front Street, a third closure will be required at the upstream tie-out crossing the Pennsylvania Central Railroad, and the fourth will be necessary at the Route 642 Bridge to complete the line of protection. Approximately 500 linear feet of levee, roughly 3 feet in height, are required to contain interior flooding along Limestone Run (U.S. Army Corps of Engineers 1995:C-1).

To construct the MSE wall and levees, the U.S. Army Corps of Engineers:

> Estimated that 33.66 acres of flood protection levee easement, 6.14 acres fee, and 6.80 acres temporary work area easement would be required for the proposed flood protection project. Tax maps from Northumberland County show that the project will traverse approximately 120 properties of which approximately 64 are residential, 7 are agricultural, and 49 are either commercial or vacant. There are an estimated 50 Public Law 91-646 relocations involved for this project. The structures within this alignment consist of approximately 33 houses, a gas station, and a small restaurant. . . .
>
> Economic analyses completed during the study indicate that the total investment in a project with a system of levees and mechanically stabilized earth walls would be $32 million for the 50-year level of protection and $35 million for the 100-year level of protection. The resulting average annual costs would be $2,538,000 and $2,813,000, respectively. Annual benefits would range from $2,726,000 to $3,301,000. The resulting benefit to cost ratio (BCR) for the 50-year alternative level of protection is 1.07 and for the 100-year level is 1.17. Environmental analyses indicated no significant adverse impacts [from these alternatives]. However, several areas may require additional cultural investigations in subsequent phases of study. The initial real estate cost estimate for the project is $3,973,000. The real estate costs are summarized as follows:

Acquisition	$ 314,000
Condemnation	$ 65,000
Appraisal	$ 134,000

Relocation Assistance	$ 36,000
Land Payments	$2,614,000
Relocation Assistance Payments	$ 810,000

There are no federally owned lands within the project area. There are no known mineral activities in the project area, which would jeopardize the construction and operation of the project. The navigational servitude of the Government would not be adversely impacted by the construction of the project (U.S. Army Corps of Engineers 1995:C.1-C.3).

14 Channel improvements are designed to increase the flow capacity of an existing channel, which results in less overbank flow and a reduced potential for flooding in adjacent areas. Typical channel improvements include river dredging, stream diversion, island clearing and removal, and concrete channel lining. These improvements have largely been discontinued, however, because they usually only provide minimal flood damage reduction and pose several problems such as loss of fish and wildlife habitat, identification of placement sites for initial and subsequent dredged material, and cost of ongoing channel maintenance (a non-Federal responsibility for Corps projects). Despite these disadvantages, channel improvements are occasionally combined with other measures such as levees and floodwalls, which enhance their capability to reduce flooding. In combination, these measures may eliminate the need for raising bridges.

The removal of Montgomery and Davis Islands, both located adjacent to the Borough of Milton, was investigated. Water surface profiles of the West Branch Susquehanna River through the Milton reach were developed using the HEC-2 computer hydraulic model and the data set developed for the Milton Flood Insurance Study in 1979. This model was modified to simulate the flooding conditions with island vegetation removed and the substrate removed to the existing surrounding riverbed elevation. No additional dredging to deeper depths or along the riverbanks was considered at this point.

The results of the computer modeling showed that the channel area consists of less than half of the total flow area in the 100-year flood plain for the river reach in which the islands are located. Therefore, the majority of the flow is carried in the flood plain, outside of the channel. Removal of the islands would only increase the 100-year flow by 30 percent in this reach. This increase in flow area would not be able to carry enough additional flow to cause a decrease in the water surface elevations by more than a minimal amount. This is because the additional channel area gained from island removal is proportionally a very small increase over a short reach of the West Branch Susquehanna River. If the islands were removed to the present river bottom elevation, the water surface profile would only decrease in elevation a maximum of 0.5 feet during a 25-year to 500-year event. This small decrease in the water surface elevation would only minimally reduce flood damages (U.S. Army Corps of Engineers 1995:4.3-4.4).

15 Upstream reservoirs retard or delay excessive runoff for the purpose of reducing downstream flows and flood stages. The function of a reservoir is to store water when runoff is high and to release it gradually after the flood threat has passed. In addition to providing flood protection to concentrated urban developments, reservoirs also protect scattered rural communities and agricultural lands. In general, the high cost and large amount of land required to create a reservoir, and adverse environmental impacts make it a highly unlikely alternative in most situations.

To provide sufficient flood protection for Milton, only a large reservoir would be adequate. Two sites, one located on the West Branch at Keating and one located on Sinnemahoning Creek just above its mouth, were investigated in the Susquehanna River Flood Control Review Study, dated August 1980. The cost of one such reservoir is roughly estimated to range from $500 million to $1.5 billion (U.S. Army Corps of Engineers 1995:4.4).

16 In their summary of the symposium's results, Dirk H. R. Spennemann and David W. Look wrote that:

> Symposia like this on the Management of Disaster Mitigation Programs for Historic Sites are very useful indeed as they open up channels of communication on both a formal and informal level. We believe that the San Francisco symposium has been a successful voyage across a treacherous sea: interagency rivalry, misunderstanding, territorial demarcation, sheer ignorance of others' concerns and a whole lot more. Some of this was implied, some covertly expressed. On occasion, some was institutional "baggage" shining through. A feeling of unequal relationship between the players in the game was expressed. All of this is human.
>
> However, by allowing each other to see the other side it should have become clear that not all is dark over there and that not all is light over here either. Disasters do not discriminate how they affect culturally significant and culturally insignificant resources, but we, as managers of the mitigation efforts, can (Spennemann and Look 1998:175).

17 Like the disaster victim, local building inspectors or structural engineers are not likely to be receptive to the real or perceived (and thus "real") "intrusion" of heritage managers when they are worrying about tagging buildings and keeping the mayor and other local [officials] off their backs. Handing out information packs containing legal information and ordinances after an event . . . is all very well, but not likely to fall on receptive ears. Training must have been completed *beforehand* and at a level which makes the relevant official feel comfortable about including the knowledge gained in the decision-making process on the spot. After the event has occurred, a short intensive refresher briefing at public meetings can reinforce the training. . . .

One of the most unnecessary side effects of many natural disasters is the loss of highly significant aspects of a nation's cultural heritage. Insufficient knowledge of the importance and management of such places leads to well-intentioned mitigation efforts which unfortunately impair or destroy cultural heritage. This can be overcome by a training course that focuses on the principles of disaster mitigation and cultural heritage management and addresses the specific mitigation needs of, and conservation options for, heritage sites. A training course should be developed and offered by distance education as a university subject and as a professional development and/or continuing education course. Such a training course would facilitate in-house and in-work training

of staff and would render obsolete the currently prevailing climate of misunderstanding and non-implementation of appropriate actions and safeguards (Spennemann and Look 1998:181).

One of the other speakers at the NPS/APT symposium, Ms. Daryl Barksdale, provides a similar argument for having education efforts mounted before a disaster occurs. From her perspective as the Georgia SHPO's Flood Assistance Coordinator, she recounts what happens when such knowledge is absent following a disaster:

> During Georgia's recovery efforts [after the flooding caused by Tropical Storm Alberto in July 1994], it has become apparent that technical information and education is crucial before, during, and after a disaster. Historic material was lost because disaster victims did not know how to deal with water damage to their resources. Often this occurred immediately after the disaster, before technical information could reach them. A chronic problem that existed was the failure of building owners to allow their structures to dry out before repair and replacement; as a result, the work often had to be redone. The Georgia Historic Preservation Division is currently planning, in coordination with the Alabama State Historic Preservation Officer, technical information workshops in the flood areas for architects, building inspectors and homeowners in the flood regions, so that they will have better knowledge in the future. As part of our grant administration, we have hired two contract architects to aid grant recipients in this area. Our architects live in the flood regions, and they provide assistance with every part of the repair process (Barksdale 1998:135).

In terms of the latter recommendation, increasing technical expertise to the local level, support for it comes from a *CRM* article published in 2000. In this article, Ms. Angela Gladwell, of FEMA's historic preservation program in Washington D.C., writes that:

> Prior to the two major disasters in 1989, the Loma Prieta earthquake and Hurricane Hugo, the relationship between emergency managers and preservationists was virtually non-existent. These were the largest disasters that significantly affected historic properties in a period when both the fields of preservation and emergency management had become firmly established.
>
> The severity of these disasters coupled with the general lack of preparedness in the cultural community and emergency management's sudden need for technical preservation expertise spawned a national effort to make disaster preparedness a priority in the preservation field (Tweedy 2000:6).

Because local governments make many decisions, Gladwell also suggests that such cooperation occur at the local level:

> Information exchange is the key outcome of successful partnerships, and all parties have plenty to learn from each other. Imparting the significant relationship of cultural resource management to local emergency managers may not be a simple task. The preservation community must seize the initiative to manifest the common goals and benefits of successful coordination. It is important for local emergency officials to know the priorities the preservation community has set for the community's historic properties and to have contact information for architects and engineers who have knowledge of historic structural systems. In addition, cultural resource managers should understand the nature of public health and safety activities and when preservation intervention is appropriate and should have access to data concerning hazard and vulnerability analyses, as well as knowledge of current initiatives and programs to reduce risk to the community's built environment. Advanced technology such as Geographic Information Systems (GIS) may facilitate the exchange of this information and provide a basis for more informed, consistent, timely, and accurate decisions. Not only can GIS provide the locations of historic resources in floodplains and other hazardous locations, but can incorporate historic resources into loss estimation models and other forms of risk analysis (Tweedy 2000:10).

18 According to Spennemann et al:

> …the establishment of a Special Interest Network (SIN) on Natural Hazard Mitigation for Cultural Heritage Sites [is] designed to provide a platform for the storage and dissemination of information on the special needs of cultural heritage sites in case of disasters. The network will provide a venue for information exchange between disaster mitigation agencies on the one hand and the cultural heritage managers on the other. . . .
>
> We believe that the proposed Special Interest Network will satisfy that need. . . . The occurrence of disasters ignores state and international boundaries, and the magnitude of most disasters stretches beyond limits of self-reliance. . . .
>
> The proposed SIN is not intended to replace the skills of professionals, such as building code inspectors or historic architects. On the contrary, it is intended to provide a conceptual framework within which these professionals can share their experiences and access vast amount of relevant information (Spennemann and Green 1998:165-66).

19 According to Spennemann and Look:

> In the past, some negative experiences have derived from interagency "turf wars" and simple misunderstandings as a result of a lack of communication. But communications must not be restricted to the disaster phase alone.
>
> Repeatedly, the need to maintain lines of communication has been stressed. As a result, taskforces on heritage needs in disaster situations have been formed. . . . However, we should not confine this communication to top-level connections at high-level meetings. These meetings and connections are fine, but they do not translate into trust. These meetings only too often translate into decrees: *Thou shalt talk to (liaise with) the NPS/FEMA/OES/SHPO/ACHP*. . . . Such approaches are not really conducive to building trust, but trust is what underpins successful management. In a disaster situation, we simply do not have the time or energy to work out whether some "drop-in" from another agency is actually any good at his or her job. Consequently, he or she is given the "arms-length treatment" rather than putting the person straight to work.

> Communication must occur across the board and may well involve going across town, or…across the corridor and joining in at a tea or coffee hour for a chat. Socialization in others' institutional culture will pay off (Spennemann and Look 1998:181-82).

20 Spennemann and Look clearly recommend such an approach in that they wrote:

> It has become clear that disasters simply over-stretch the resources and capacities of the local staff. What can be done?
>
> Building on the FEMA concept of having a register of available professional staff that FEMA can borrow from other agencies in case of an emergency, it may well be a sensible idea to pull in a small Heritage Damage Assessment Task Force from interstate. This task force would assist the local staff in the verification of red-tag decisions, run routine Section 106 matters, provide instant advice to homeowners and so forth. But these are not the only benefits. Consider also that such a team would:
>
> - Fill the gap of the first two weeks before "standard" responses "kick in";
> - Experience the trauma following an actual event (rather than relying on theory);
> - Gain actual first-line people management skills;
> - Develop team relationships;
> - Work out "snags" in the team's communication with the emergency services; and
> - Establish close relationships with other state teams (Spennemann and Look 1998:182).

Following the 1994 flood caused by Tropical Storm Alberto, the Historic Preservation Division of the Georgia Department of Natural Resources, which serves as the State Historic Preservation Office, effectively used such teams:

> As the flooding continued, the Historic Preservation Division organized disaster response teams to travel to the flooded areas as soon as it was deemed safe. The disaster response teams were in the field by July 14th. These teams were composed of a Historic Preservation Division preservation architect and an architectural historian, plus field representatives from other government agencies. The National Trust and the Georgia Trust for Historic Preservation both sent architectural specialists to assist with damage estimates. Each team's job was to conduct a basic inventory of historic resources, assess damage, and to make technical assistance readily available. As the response teams traveled across South Georgia, other Historic Preservation Division staff were planning a long-term flood recovery program and preparing a special funding request for federal flood recovery based on the teams' assessments (Historic Preservation Division 1997:7).

That the Georgia SHPO was able to provide its technical expertise in the wake of Tropical Storm Alberto was highly valuable. According to Barksdale, the state preservation office had no previous disaster response experience but that it was beneficial for the SHPO staff to:

> …go into the field with representatives of other state agencies. This was beneficial not only to the SHPO, but to the disaster victims as well, since the information presented was coordinated. The Governor's Office of Georgia formed an interagency flood recovery team that included [the] Historic Preservation Division, FEMA, the Georgia Emergency Management Agency, and other state agencies. The team visited different cities in the state and discussed the Historic Preservation Division's flood recovery grants, the U.S. Small Business Administration loans, FEMA aid, and the application procedure for the aid. Packets were handed out so that the information was delineated for them (Barksdale 1998:134).

21 Communities want assistance in identifying funding sources to leverage against the seed money that has already been provided. Participants believe that their communities have set ambitious goals regarding what they want to accomplish, but also acknowledge that they have difficulty finding needed support to follow through. Even if FEMA does not provide additional financial assistance, the agency can help communities locate and tap into other funding sources (Wachtendorf, Riad and Tierney 2000:47).

22 According to 44 CFR §360.1:

The Emergency Management Training Program is designed to enhance the States' emergency management training . . . to increase State capabilities and those of local governments in this field, as well as to give States the opportunity to develop new capabilities and techniques. The Program is an ongoing intergovernmental endeavor which combines financial and human resources to fill the unique training needs of local government, State emergency staffs and State agencies, as well as the public. States will have the opportunity to develop, implement, and evaluate various approaches to accomplish FEMA emergency objectives as well as goals and objectives of their own. The intended result is an enhanced capability to protect lives and property through integration.

Many of the terms appearing in this glossary are also defined in the margins of pages on which they first appear or explained in the text of this study.

Asset: Any manmade or natural feature that has value, including but not limited to: people; buildings; infrastructure; such as bridges, roads, sewer and water systems, electrical and communications systems; and environmental, cultural, or recreational features including parks, dunes, wetlands, and historic properties.

Acquisition: Through FEMA's hazard mitigation program, the means of acquiring privately owned land that is subject to natural hazards for the purposes of removing repetitively and/or substantially damaged improvements upon the property and reducing further risks to human life and property. As with other provisions of the hazard mitigation program, acquisition of private land is voluntary. Additionally, acquisition is typically conducted through a "buyout" where FEMA provides funding to a local government to acquire the land. The subject land then becomes the property of a local government with the assurance that the land will be dedicated in perpetuity for open-space or recreational purposes and that no structure or other improvements will be erected except buildings that are open on all sides (such as picnic shelters) or restroom buildings. The community must also agree to remove without cost to FEMA any damaged buildings to which it accepts title from FEMA by demolition, relocation, donation, or sale of these buildings.

Advisory Council on Historic Preservation (ACHP): An independent federal agency that reports to the President and Congress on historic preservation matters.

Base Flood: A flood that has a one-percent probability of being equaled or exceeded in any given year. Also known as the 100-year flood.

Base Flood Elevation (BFE): The elevation of a 100-year flood. The BFE is determined by statistical analysis of stream-flow records for the watershed and rainfall and runoff characteristics in the general region of the watershed. This elevation is also the basis of the insurance and floodplain management requirements of the National Flood Insurance Program.

Community: As defined by the National Flood Insurance Program (NFIP), any state, area, or political jurisdiction or any Native American tribe, authorized tribal organization, Alaska native village, or authorized native organization that has the authority to adopt and enforce floodplain management ordinances for the area under its jurisdiction. In most cases, a community is an incorporated city, town, township, borough, or village or an unincorporated area of a county or parish. However, some states have statutory authority that varies from this definition.

Community Rating System (CRS): An NFIP program that provides incentives for NFIP communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of policyholders in these communities are reduced.

Compaction: Construction process where the density of earth fill is increased so that it will create a sound base for the foundation of a building or other structure.

Critical Facility: Facilities that are critical to the health and welfare of the population and that are especially important following hazard events or disasters. Critical facilities include but are not limited to: shelters; police and fire stations, and hospitals.

Debris: The scattered remains of assets broken or destroyed in a hazard event. Debris caused by a wind or water hazard event can cause additional damage to other assets.

Design Capacity: Volume of water that a channel, pipe, or other drainage line is designed to convey.

Disaster: A major detrimental impact of a hazard upon the population and economic, social, and built environment of an affected area. Typically, disasters are caused by a natural (as opposed to human-

caused or technological) hazard upon the built environment of an affected area. Also see "declared disaster" and "major disaster."

Dry Floodproofing: Method of protecting a building by sealing its exterior walls in order to prevent the entry of flood waters. Also see "Wet Floodproofing."

Elevation: The process of raising a building so that it is above the height of a given flood.

Emergency: As defined in the Stafford Act: "any occasion or instance for which, in the determination of the President, federal assistance is needed to supplement state and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States."

Emergency Response Plan: A document that contains information on the actions that may be taken by a governmental jurisdiction to protect people and property before, during, and after a disaster.

Encroachment: Any physical object placed in a floodplain that hinders the passage of water or otherwise affects flood flows.

Erosion: Process by which flood waters lower the ground surface in an area by removing upper layers of soil.

Essential Facility: Facilities that are important to ensure the full recovery of a community or state following a hazard event. These would include: government functions; major employers; banks; schools; and certain commercial establishments such as grocery stores, hardware stores, and gas stations.

Existing Construction: Those structures already existing or on which construction or substantial improvement was started prior to the effective date of a community's floodplain management regulations.

Federal Emergency Management Agency (FEMA): Independent federal agency created in 1978 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery. FEMA administers the National Flood Insurance Program (NFIP).

Federal Insurance Administration (FIA): Component of FEMA directly responsible for administering the flood insurance aspects of the National Flood Insurance Program (NFIP).

Fill: Material such as soil, gravel, or stone that is dumped into an area in order to increase the ground elevation. Fill is usually placed in layers and each layer compacted.

Five Hundred-Year Floodplain: The area including the floodplain that is subject to inundation from a flood having a 0.2 percent chance of being equaled or exceeded in a particular location in any given year.

Flash Flood: A flood that rises very rapidly and usually is characterized by high flow velocities. Flash floods often result from intense rainfall over a small area, often in areas having steep terrain. They occur with little or no warning.

Flood: Under the National Flood Insurance Program (NFIP), a flood is defined as the partial or complete inundation of normally dry areas from 1) the overland flow of a lake, river, stream, ditch, or other waterway; 2) the unusual and rapid accumulation or runoff of surface waters; and 3) mudflows or the sudden collapse of shoreline land. Flooding may also result from the overflow of inland or tidal waters.

Flood Depth: Height of flood waters above the surface of the ground at a given point.

Flood Duration: Amount of time between the initial rise of flood waters and their recession.

Flood Elevation: Elevation of the water surface above an established datum, e.g. National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or Mean Sea Level.

Flood Frequency: Probability, expressed as a percentage, that a flood of a given size will be equaled or exceeded in any given year. The flood that has a one-percent probability (i.e. a flood with a one in 100 chance of occurring) of being equaled or exceeded in any given year is often referred to as the 100-year flood. Similarly, the floods that have a 2-percent probability (i.e. a flood with a one in 50 chance) and a 0.2-percent probability (i.e. a flood with a one in 500 chance) of being equaled or exceeded in any year are referred to as the 50-year flood and the 500-year flood, respectively.

Flood Hazard Area: The area shown to be inundated by a flood of a given magnitude on a map.

Flood Insurance Rate Map (FIRM): An official map of a community, issued or approved by the Federal Emergency Management Agency (FEMA), that delineates both the special hazard areas and the risk premium zones applicable to the community.

Flood Insurance Study (FIS): A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.

Floodplain: Any normally dry land area that is susceptible to inundation by water from any natural source. This area is often low land adjacent to a river, stream, watercourse, ocean, or lake. Also see "Regulatory Floodplain."

Floodplain Management: The operation of a program of corrective and preventive measures for reducing flood damage, including but not limited to flood control projects, floodplain land-use regulations, floodproofing or retrofitting of buildings, and emergency preparedness plans.

Floodproofing: Structural or nonstructural changes or adjustments included in the design, construction, or alteration of a building that reduce damage to the building and its contents from flooding (also see "Dry Floodproofing" and "Wet Floodproofing").

Flood Protection Elevation (FPE): Elevation of the highest flood that a retrofitting method is intended to protect against.

Floodwall: A flood barrier constructed of manmade materials, such as concrete or masonry.

Floodway: Portion of the regulatory floodplain that must be kept free of development so that flood elevations will not increase beyond a set limit. Under the National Flood Insurance Program (NFIP), this limit is a maximum of 1 foot. The floodway often consists of the stream channel and land along its sides.

Flow Velocity: Speed at which water moves during a flood. Velocities usually vary across the floodplain. They are usually greatest near the channel and lowest near the edges of the floodplain.

Freeboard: Additional amount of height incorporated into the FPE to account for uncertainties in the determination of flood elevations.

Geographic Area Impacted: The physical area in which the effects of the hazard are experienced.

Geographic Information System (GIS): A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.

Grade Beam: In a slab foundation, a support member cast as an integral part of the slab, as opposed to a separate footing.

Hazard: A source of potential danger or adverse condition. Also, an event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss.

Hazard Event: A specific occurrence of a particular type of hazard.

Hazard Identification: The process of identifying hazards that threaten a geographic area including their physical characteristics, magnitude or severity, probability, frequency, causes, and locations or areas affected.

Hazard Mitigation: Action taken to reduce or eliminate long-term risk to people and property from hazards such as floods, earthquakes, and fires.

Hazard Profile: A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these factors when they are recorded and displayed as maps.

Historic Property: Any property that is listed in the National Register of Historic Places, or may be eligible for listing (Also see "National Register of Historic Places").

Human Intervention: Any action that a person must take to enable a flood protection measure to function as intended . This action must be taken every time flooding becomes a threat.

Hydrodynamic Force: Force exerted by moving water.

Hydrodynamic Loads: As flood water flows around a structure it imposes loads on the structure. These loads consist of frontal impact by the mass of moving water against the structure, drag effect along the sides of the structure, and eddies or negative pressure on the structure's downstream side.

Hydrology: The science of the behavior of water in the atmosphere, on the earth's surface, and underground.

Hydrostatic Force: Force exerted by water at rest, including lateral pressure on walls and uplift (buoyancy) on floors.

Hydrostatic Loads: Those loads or pressures resulting from the static mass of water at any point of flood water contact with a structure. They are equal in all directions and always act perpendicular to the surface on which they are applied. Hydrostatic loads can act vertically on structural members such as floors, decks, and roofs, and can act laterally on upright structural members such as walls, piers, and foundations.

Impervious Soils: Soils that resist penetration by water.

Individual Assistance Programs: Supplemental federal assistance available under the Stafford Act to individuals and families; includes disaster housing assistance, unemployment assistance, grants, loans, legal services, crisis counseling, tax relief, and other services or relief programs.

Infrastructure: Refers to the public and private services that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access; vital services such as public water supplies and sewer treatment facilities; and an area's transportation system. These systems include: airports; heliports; airplane terminals; highways; bridges; tunnels; roadbeds; overpasses; railways; rail yards; depots; waterways; canals; locks; seaports; ferries; harbors; drydocks; piers; reservoirs; and dams.

Intensity: A measure of the effects of a hazard event at a particular place.

Levee: Flood barrier constructed of compacted soil and designed to keep flood waters from inundating an area behind the barrier.

Local Officials: Community employees who are responsible for floodplain management, zoning, permitting, building code enforcement, and building inspection.

Lowest Floor: As used in the NFIP, the lowest floor of the lowest enclosed area within the building including the basement.

Major Disaster: As defined in the Stafford Act, "any natural catastrophe (including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought), or, regardless of cause, any fire, flood, or explosion in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance under this Act to supplement the efforts and available resources of states, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby."

Magnitude: A measure of the severity or strength of a hazard event. The magnitude of a given hazard event is usually determined using technical measures specific to the hazard.

Mean Sea Level (MSL): The average height of the sea for all stages of the tide, usually determined from hourly height observations over a 19-year period on an open coast or in adjacent waters having free access to the sea.

Mitigation: Sustained action taken to reduce or eliminate the long-term risk to human life and property from natural hazards and their effects. Note that this emphasis on long-term risk distinguishes mitigation from actions geared primarily to emergency preparedness and short-term recovery.

Mitigation Plan: A systematic evaluation of the nature and extent of vulnerability to the effects of natural hazards typically present in the state and includes a description of actions to minimize future vulnerability to hazards.

Mutual Aid Agreements: Agreements between local, state, regional, and/or national agencies to reduce duplication of efforts and increase the effectiveness of emergency response and other post-disaster activities. Such agreements are often used to provide supplemental staff assistance in the post-disaster environment.

National Environmental Policy Act (NEPA): The National Environmental Policy Act establishes the broad national framework for protecting the environment. NEPA's basic policy is to ensure that all branches of government give proper consideration to the environment ***prior*** to undertaking any major federal action that significantly affects the environment. In general, this law established a national policy which would 1) "encourage productive and enjoyable harmony between man and his environment"; 2) promote efforts which would "prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man"; and 3) "enrich the understanding of the ecological systems and natural resources important to the Nation."

National Flood Insurance Program (NFIP): Federal program created by Congress in 1968 that makes flood insurance available in communities that enact the minimum floodplain management regulations outlined in 44 CFR §60.3.

National Geodetic Vertical Datum (NGVD): Datum established in 1929 and used in the NFIP as a basis for measuring flood, ground, and structural elevations that were previously measured according to Sea Level Datum or Mean Sea Level. The Base Flood Elevations shown on most of the Flood Insurance Rate Maps issued by the Federal Emergency Management Agency are referenced to NGVD.

National Historic Preservation Act: In response to the rapid loss of historic resources from urban renewal in the 1950s and 60s, Congress passed this Act in 1966 to ensure that federal agencies, including FEMA, consider historic properties in their project planning and execution, and encourage States to begin their own historic preservation programs. The primary components of the Act are: the adoption of the National Register of Historic Places as the official list of historic properties; the creation of the Advisory Council on Historic Preservation and State Historic Preservation Offices; and the requirement of federal agencies to establish historic preservation programs, designate a Federal Preservation Officer, and consider the effects of federal undertakings on historic properties.

National Register of Historic Places: The nation's honor roll of historic properties that are considered worthy of preservation. For the purposes of Section 106 review and compliance, properties

National Weather Service (NWS): Prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to federal and state entities in preparing weather and flood warning plans.

Natural Hazard: Hurricanes, tornadoes, storms, floods, tidal waves, tsunamis, high or wind-driven waters, volcanic eruptions, earthquakes, snowstorms, wildfires, droughts, landslides, and mudslides.

New Construction: As defined under the National Flood Insurance Program (NFIP), structures for which construction or substantial improvement was started after the effective date of a community's floodplain management regulations. New construction also includes any subsequent improvements to such structures. The same concept may be used in connection with local land-use regulations applying to other types of defined hazardous areas.

North American Vertical Datum Plane: Elevation datum currently used by FEMA for the determination of flood elevations.

One-Hundred-Year Floodplain: The area including the base floodplain, which is subject to inundation from a flood event that has a one-percent chance of being equaled or exceeded in a particular location in any given year (Also see "Base Flood"). This reference is used for regulatory purposes in the National Flood Insurance Program (NFIP). While this is the most common reference point statistically, the same language applies in referring to other actual or hypothetical events in terms of their statistical probabilities—such as 50-year flood, a 350-year flood—when referring respectively to a 2-percent chance or a 0.285 percent chance of being equaled or exceeded in any given year.

Permeable Soils: Soils that water can easily permeate and spread through.

Planning: The act or process of making or carrying out plans; the establishment of goals, policies, and procedures for a social or economic unit.

Planning for Post-Disaster Reconstruction: The process of planning (preferably prior to an actual disaster) those steps the community will take to implement long-term reconstruction with one of the primary goals being to reduce or minimize its vulnerability to future disasters. These measures can include a wide variety of land-use planning tools, such as acquisition, design review, zoning, and subdivision review procedures. It can also involve coordination with other types of plans and agencies but is distinct from planning for emergency operations, such as the restoration of utility service and basic infrastructure.

Probability: A statistical measure of the likelihood that a hazard event will occur.

Public Assistance Programs: Supplemental federal assistance available under the Stafford Act to state and local governments or eligible private, nonprofit organizations providing critical services. Such assistance may include: cost-share funding of debris clearance; emergency protective measures for preservation of life and property; repair and replacement of roads, streets, bridges, water control facilities, public buildings, and public utilities; community disaster loans; use of federal equipment, supplies, and personnel facilities; repairs to federal aid system roads when authorized by the U.S. Department of Transportation; and other assistance.

Rates of Rise and Fall: How rapidly the elevation of the water rises and falls during a flood.

Reconstruction: The long-term process of rebuilding the community's destroyed or damaged housing stock, commercial and industrial buildings, public facilities, and other structures. As defined here, it is often the last phase of the community's reaction to a natural disaster. This process is sometimes referred to as "long-term recovery."

Recovery: The process of restoring normal public or utility services following a disaster, perhaps starting during but extending beyond the emergency period to that point when the vast majority of such services, including electricity, water, communications, and public transportation, have resumed normal operations. Short-term recovery does not include the reconstruction of the built environment, although reconstruction may commence during this period. Long-term recovery (**See Reconstruction**) is the process of returning the community, to the extent possible, to the conditions that existed prior to the event, preferably while taking advantage of opportunities to mitigate against future disasters.

Recurrence Interval: The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any given year.

Redevelopment: The process of rebuilding a community's economic activity similar to the process of reconstruction. Redevelopment differs from economic recovery in that it goes beyond the process of merely restoring disrupted economic activity to the creation of new economic opportunities and enterprises in the aftermath of the recovery period, particularly including those that arise as by-products or direct outcomes of the disaster itself.

Regulatory Floodplain: Flood hazard area within which a community regulates development, including new construction, the repair of substantially damaged buildings, and substantial improvements to existing buildings. In communities participating in the NFIP, the regulatory floodplain must include at least the area inundated by the base flood, also referred to as the "Special Flood Hazard Area" (SFHA). Also see "Floodplain."

Regulatory Floodway: As defined under the National Flood Insurance Program (NFIP), the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

Relocation: In retrofitting, the process of moving a building or structure to a new location outside of the flood hazard area.

Repetitive Loss Property: A property for which two or more NFIP losses of at least $1,000 each have been paid within any 10-year period since 1978.

Replacement Value: The cost of rebuilding a building or structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type, and quality.

Retrofitting: Making changes to an existing house or other building to protect it from flooding or other hazards.

Response: Actions and activities that support state and local government efforts to save lives and protect public health, safety, and property.

Risk: The potential loss associated with a hazard, defined in terms of expected probability and frequency, exposure, and consequences. Also, the estimated impact that a hazard would have on people, services, facilities, and structures in a community; or the likelihood of a hazard event resulting in an adverse condition that causes injury or damage. Risk is often expressed in relative terms such as a high, moderate, or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.

Risk Assessment: A process or method for evaluating risk associated with a specific hazard and defined in terms of probability and frequency of occurrence, magnitude and severity, exposure, and consequences.

Saturated Soils: Soils that have absorbed, to the maximum extent possible, water from rainfall or snowmelt.

Scour: Process by which flood waters remove soil around objects that obstruct flow, such as the foundation walls of a building. The term is often used to describe storm-induced, localized conical erosion around pilings and other foundation supports where the obstruction of flow increases turbulence.

Sealant: In retrofitting, a waterproofing material or substance used to prevent the infiltration of flood water into a building.

Section 106: A provision within the National Historic Preservation Act that requires: 1) federal agencies to consider what effect, if any, their projects (or the projects that they fund, license, permit or otherwise assist) will have to historic properties, and 2) afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on these effects.

Service Equipment: In retrofitting, the utility systems, heating and cooling systems, and large appliances in a house.

Sound Land Management and Use: The process wherein the governmental body responsible for land use regulation in a political jurisdiction plans and regulates the use of land within its jurisdiction in order to promote the reduction of property exposure to flood hazard and the protection of environmental values of floodplains. Sound use of land acquired with FEMA funds and transferred to local governments is used primarily for open space and recreational purposes to minimize potential for any future flood damage.

Special Flood Hazard Area (SFHA): As defined under the National Flood Insurance Program (NFIP), areas within a community that have been identified as susceptible to a one-percent or greater chance of flooding in any given year. A one-percent chance probability flood is also known as a "100-year flood" or the "base flood." An SFHA may also be defined as the portion of the floodplain that is subject to inundation by the base flood. SFHAs are represented on Flood Insurance Rate Maps by darkly shaded areas with zone designations that include the letter A or V.

Stafford Act: The Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, Public Law 93-288. The Stafford Act is the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and its programs. The law also provides the greatest single source of disaster assistance.

Structure: As defined under the National Flood Insurance Program (NFIP), a walled and roofed building that is principally above ground. This definition includes manufactured housing and other structures that are used for purposes other than human habitation such as a tank for storing gas or liquid.

Substantial Damage: Damage of any origin sustained by a building whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the building before the damage occurred.

Substantial Improvement: As defined under the National Flood Insurance Program (NFIP), any repair, reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure **1)** before the start of construction of the improvement; or **2)** if the structure has been damaged and is being repaired, before the damage occurred. This term applies to structures that have incurred substantial damage, regardless of the actual repair work performed.

Topographic: Characterizes maps that show natural features and indicate the physical shape of the land using contour lines. These maps may also include manmade features.

Vulnerability: The level of exposure of human life and property has to damage from natural hazards. Vulnerability describes how exposed or susceptible to damage an asset may be. Vulnerability depends upon an asset's construction, contents, and the economic value of its functions. Like indirect damages,

the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend upon uninterrupted electrical power; if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.

Vulnerability Assessment: The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.

Watershed: An area from which water drains to a single point. In a natural basin, the watershed is the area contributing flow to a given place or stream.

Watershed Management: The implementation of a plan or plans for managing the quality and flow of water within a watershed, the naturally defined area within which water flows into a particular lake or river or its tributary. The aims of watershed management are holistic and concern the maintenance of water quality, the minimization of stormwater runoff, the preservation of natural flood controls, such as wetlands and pervious surface, and the preservation of drainage patterns. Watershed management is, in many ways, an enlargement of most of the concerns that underlie floodplain management.

Wet Floodproofing: Protecting a building by allowing flood waters to enter so that internal and external hydrostatic pressures are equalized. Usually, only enclosed areas used for parking, storage, or building access are wet floodproofed (See also "Dry Floodproofing").

Zone: A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.

APT: Association for Preservation Technology.
BCA: Benefit Cost Analysis.
BFE: Base Flood Elevation.
CDBG: Community Development Block Grant.
CLG: Certified Local Government.
CRS: Community Rating System.
DOE: Determination of Eligibility.
EMGP: Emergency Management Performance Grant Program.
EPA: Environmental Protection Agency.
FEMA: Federal Emergency Management Agency.
FIA: Federal Insurance Administration.
FIFMTF: Federal Interagency Floodplain Management Taskforce.
FIRM: Flood Insurance Rate Map.
FIS: Flood Insurance Study.
FPE: Flood Protection Elevation.
GIS: Geographic Information System.
HMGP: Hazard Mitigation Grant Program.
HUD: Housing and Urban Development.
ICC: Increased Cost of Compliance.
NEPA: National Environmental Policy Act.
NFIP: National Flood Insurance Program.
NGVD: National Geodetic Vertical Datum.
NHPA: National Historic Preservation Act.
NPS: National Park Service.
NRCS: National Resources Conservation Service.
NTHP: National Trust for Historic Preservation.
NWS: National Weather Service.
PA: Programmatic Agreement.
PEMA: Pennsylvania Emergency Management Agency.
PHMC: Pennsylvania Historical and Museum Commission.
SBA: Small Business Administration.
SFHA: Special Flood Hazard Area.
SEDA-COG: Susquehanna Economic Development Association-Council of Governments.
SFHA: Special Flood Hazard Area.
SIN: Special Interest Network.
URS: URS Group, Inc.

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